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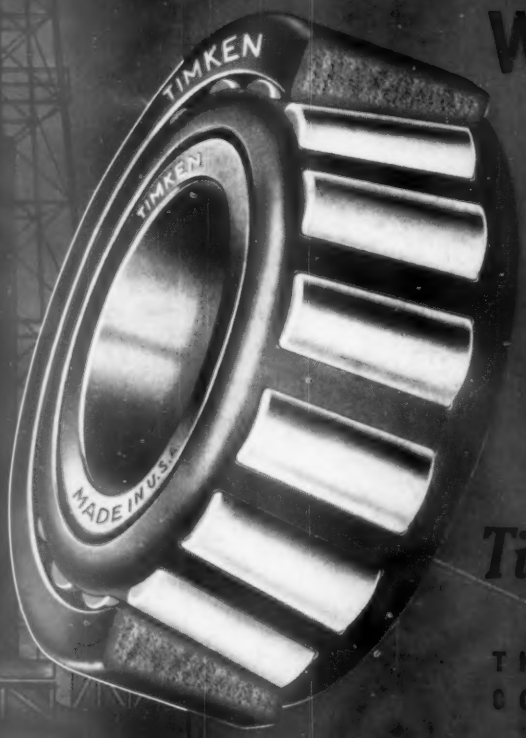

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OCTOBER 13, 1945

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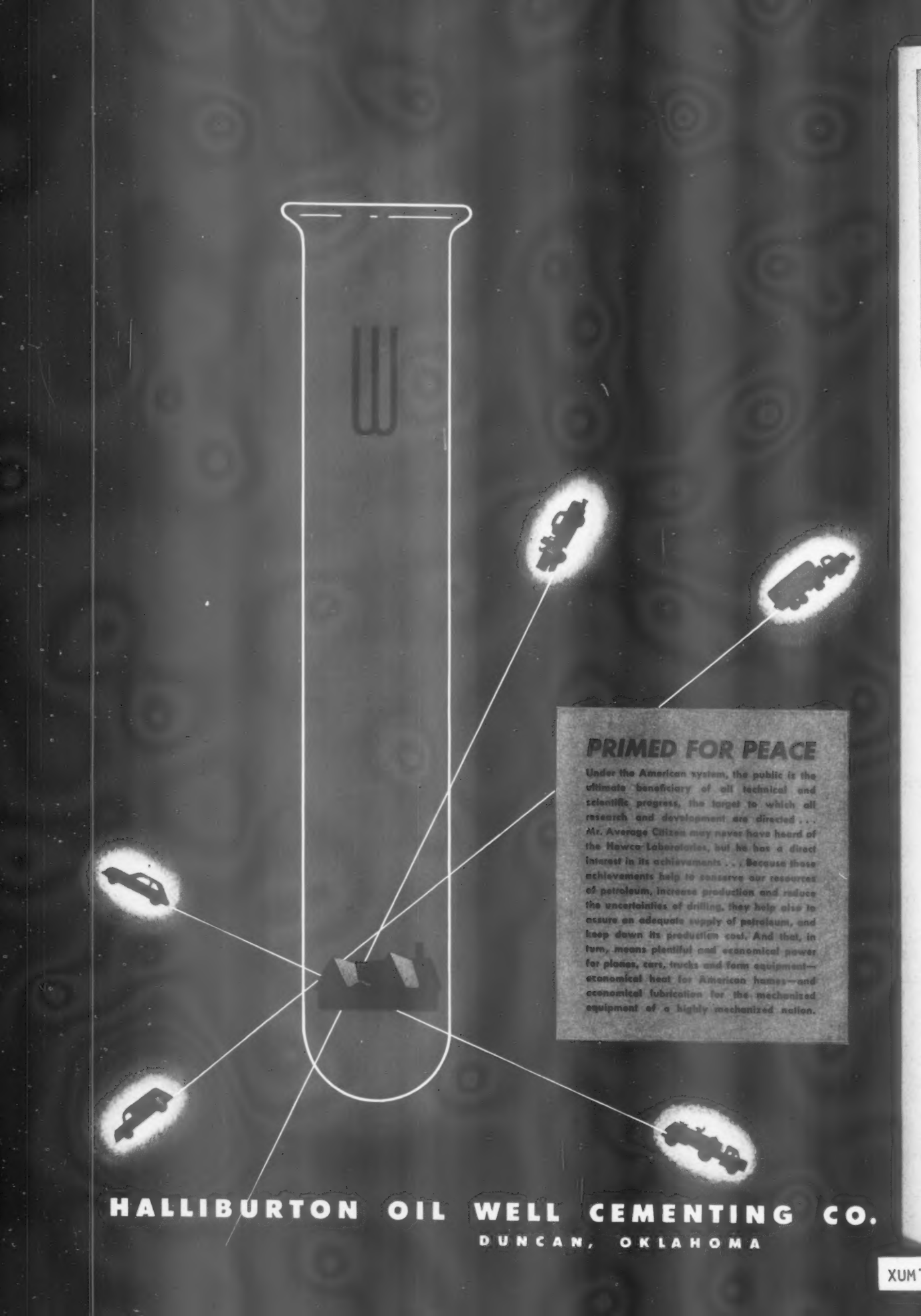

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XUM

the OIL AND GAS JOURNAL

published weekly by the

PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE AVE., TULSA 1, OKLAHOMA

Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1945, by The Petroleum Publishing Co.

Vol. 44, No. 23 October 13, 1945

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LOOKING AHEAD with the Chemical Industry

PORTER "Better Built" PROCESS EQUIPMENT

H. K. PORTER COMPANY, Inc. and Subsidiaries design and build processing equipment for the chemical industry. To provide the most advanced type of equipment for the world's fastest changing and most rapidly growing industry, PORTER maintains a complete central research and development laboratory. A large engineering staff is devoted to the task of keeping pace with present requirements as well as anticipating future demands for new designs in processing equipment.

How well this is being accomplished is demonstrated by the PORTER-DEVINE-QUIMBY line of process equipment. *Better-Built* in every respect and designed in accordance with the most recent developments in the processing field, P-D-Q equipment has won well-merited acceptance among chemical plants throughout this country and abroad.

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PORTER *Agitators, Mixers, Blenders, Ball and Pebble Mills, Wood Tanks*

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H. K. PORTER COMPANY, Inc.

PITTSBURGH 22, PENNSYLVANIA

the OIL AND GAS JOURNAL

Trends

Crude-Oil Production
By States—Page 165

CRUDE-OIL STOCKS 222,387,000 bbl. as of Sept. 29—up 6,970,000 bbl. One year ago 222,390,000 bbl.

GASOLINE STOCKS 79,552,000 bbl. as of Sept. 29—down 3,349,000 bbl. One year ago 76,908,000 bbl.

RESIDUAL FUEL-OIL STOCKS 46,853,000 bbl. as of Sept. 29—down 748,000 bbl. One year ago 64,256,000 bbl.

GAS OIL AND DISTILLATE STOCKS 43,689,000 bbl as of Sept. 29—up 69,000 bbl. One year ago 43,592,000 bbl.

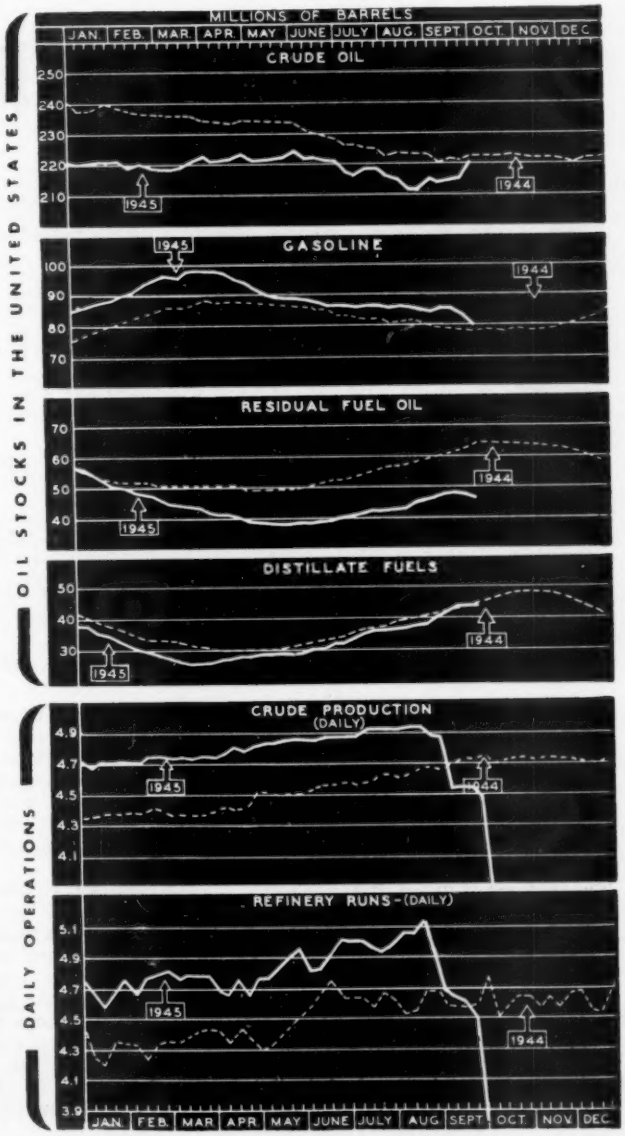
CRUDE-OIL PRODUCTION 3,618,500 bbl. as of Oct. 6—down 862,650 bbl. One year ago 4,697,350 bbl.

REFINERY RUNS 3,812,000 bbl. daily week ended Sept. 29—down 687,000 bbl. One year ago 4,825,000 bbl.

IN THE midst of postwar uncertainties, labor troubles, and reconversion problems, one trend in the oil industry stands out clearly. There is to be no slackening, no relaxing, in the intensity of the search for new reserves. This is no sudden whim or temporary mood. One year ago, when The Oil and Gas Journal was seeking information about postwar trends, key executive geologists of the industry indicated they expected wildcatting and other exploratory activity in the whole postwar period to decrease only 8 per cent from the feverish wartime pace. Recently these same men indicated that even in the probable low point of the reconversion lull between V-J Day and the middle of 1946, they expected a maximum decrease of less than 15 per cent in exploration activity.

ANOTHER indication of this trend is the interest displayed in any line of research activity that will help exploration. Searching study is going on among the petroleum geologists. They are examining their science with a critical eye, rechecking fundamentals, analyzing their research projects, measuring progress already made—all with the idea of deciding whether a satisfactory base has been established. A satisfactory base for what? A satisfactory base from which to advance their science to a point that will be adequate for the needs of the future. This is a mood which has the wholehearted moral and financial support of the executive geologists, and these latter men are motivated by their knowledge of the long-range policies of their respective companies.

ADDITIONAL evidence of this trend is to be found in other places. There are many manufacturers making or improving tools that are used, directly or indirectly, to find new oil fields. There are research units, sometimes within a manufacturer's organization, sometimes independent, sometimes a part of the oil companies' organizations. All of these find intense interest in any progress they have to report. Progress along either of two main lines attracts about the same degree of interest. One is progress that promises to achieve substantial reductions in the cost of using old tools, even if no improvement in other aspects is achieved. The second is progress along any line of development that gives reasonable promise of producing, even over a long term, some new exploration tool.



Pickets continued to walk their posts as notices of oil-plant seizures were posted at Port Arthur refineries. Subsequently, O. A. Knight, chairman of the international executive council of the Oil Workers International Union (C.I.O.) notified strikers by telegram to return to work

Navy Takes Over Strike-Bound Plants But Basic Issues Remain Unsettled

NOTICE
BY EXECUTIVE ORDER OF THE PRESIDENT OF THE UNITED STATES THE SECRETARY OF THE NAVY WAS DIRECTED TO TAKE POSSESSION OF THE PLANTS AND FACILITIES OF THE TEXAS COMPANY LOCATED IN AND AROUND PORT ARTHUR, TEXAS, AND TO OPERATE OR ARRANGE FOR THE OPERATION THEREOF IN SUCH MANNER AS HE DEEMS NECESSARY FOR THE WAR EFFORT.
IN ACCORDANCE WITH THAT ORDER I HAVE BEEN AUTHORIZED AND DIRECTED ON BEHALF OF THE SECRETARY OF THE NAVY TO TAKE POSSESSION OF SAID PLANTS AND FACILITIES TOGETHER WITH ANY REAL OR PERSONAL PROPERTY AND OTHER ASSETS USED IN CONNECTION THEREWITH.
PURSUANT TO SUCH DIRECTION I HAVE TAKEN POSSESSION THEREOF AND HAVE AUTHORIZED THIS NOTICE TO BE POSTED AS EVIDENCE OF SUCH FACT.
Dated: 10-4-45
SIGNED: BEN MOREELL,
VICE ADMIRAL, USN
OFFICER IN CHARGE

Refinery gates carried notices of Navy possession of struck oil plants

WASHINGTON.—Although operations were being resumed this week at refineries throughout the country where strikes had threatened to paralyze, not only the oil industry but other industries dependent upon its products, basic issues remained unsettled and eventual outcome of union demands were conjectural.

Conforming with an order issued by President Truman October 5 under provisions of the Connally Anti-strike Act, refining and pipe-line facilities which had been closed or were threatened with shutdowns were placed under control of the Navy. O. A. Knight, head of the Oil Workers International Union (C.I.O.), sent telegrams from his office in Washington directing strikers to go back to work. Some 43,000 union men thereupon began returning to their jobs, with the federal Government in technical possession of approximately a third of the nation's refining capacity.

The task of taking over the strike-bound plants was assigned to Vice Adm. Ben Moreell, chief of the Navy's bureau of yards and docks. His first official act was to send messages to plant managers to proceed with operations in the name of the Government. He then began dispatching Navy officers to the plants as his representatives.

Knight said the union was "not capitulating to the oil companies," but was still "on strike" against them and would continue its fight for a wage increase of 30 per cent to compensate for loss of overtime pay.

With resumption of the 40-hour week following the end of the war, oil companies voluntarily increased wages 15 per cent. This did not satisfy the union, which wanted the same take-home pay that had been received for 52 hours' work. The companies said this was out of the question unless they could raise prices of their products.

The union's willingness to arbitrate its wage demand and to cooperate with the Navy, Knight said, "imposes upon the Government the responsibility of seeing that the just wage demands of its oil workers are met."

Most of the strike-bound refineries from coast to coast would be delivering gasoline and oil within 5 days, Knight predicted.

He acknowledged he was unable to state positively that all the striking locals in 15 states would obey the order to resume work. He said he did not expect that any would choose to prolong the strike.

Knight said the union would seek to open wage negotiations directly with the Navy. This would be done, he added, on the theory that President Truman's executive order gives the Navy full management rights at the affected plants, including the right to enter contracts.

Meantime, Knight said, the union is ready to negotiate with any or all

oil companies while the plants are in Government possession.

The back-to-work telegrams to local unions instructed them to "cooperate with the federal Government in placing the oil industry back in operation and to continue such cooperation as long as the oil industry is under seizure."

President Truman, in his executive order, directed the secretary of the Navy to take possession of designated plants and facilities "used in the transportation, refining, and processing of petroleum and petroleum products."

"Oil is so vital to the continuing military operation, and so essential to production for the armed services and national security at home," said the president, "that we must move without further delay to protect our petroleum supply positions. The public interest, in an emergency of this character, transcends the interests of any group.

"In furtherance of the purposes of this order, the secretary of the Navy is authorized to select and hire such employes and agents as he deems necessary and suitable to carry out the provisions of this order; to exercise any contractual or other rights of the owners of said plants, facilities, and property incident to the operation of said plants, facilities, and property or the production, sale, and distribution of the products and services thereof; to do any and all other things that he may deem necessary or desirable for, or incidental to, the use and operation of said plants, facilities, and property, or the production, sale, and distribution of the products and services thereof; and to take any other steps that he deems necessary to carry out the provisions and purposes of this order."

The president's action came after a week of attempts by the Government to conciliate a series of strikes. Secretary of Labor Lewis B. Schwellenbach first attempted to mediate the dispute through the Labor Department's conciliation service and then proposed that an impartial arbitrator be appointed with power to make a binding settlement. The managements of most of the companies involved imposed so many qualifications on the powers of the arbitrator that the secretary considered this a rejection of arbitration and certified to the president that the work stoppage threatened to injure other industries and the general public. The president's executive order followed immediately, directing the Navy to operate the plants until the dispute is settled.

It had been expected that the president would order Petroleum Administration for War to take over the refineries and pipe lines, since PAW was the operating agency for oil facilities seized during the war because of labor disputes. Among reasons advanced for his failure to do this, was belief that the union protested that PAW is dominated by oil-company management. Whether Navy operation will be more to the liking of the union remains to be seen.

Navy officials said they would not attempt to settle the basic issues of the dispute, indicating that the Navy itself will not negotiate with the workers. Normal procedure in such plant seizures is for the dispute to be certified to War Labor Board to work out an ultimate settlement. However, WLB is liquidating.

Under the terms of the seizure, wages and working conditions are to remain as they were before the strike until a new settlement is made, but it is generally expected that the union will not be satisfied with Navy operation at former wage rates. Another strike would now be a strike against the Government, something which never happened during wartime and a condition for which there are no precedents. Thus the ultimate outcome of the controversy and the methods for settling it are uncertain.

Companies involved in the dispute which had not already offered their employes an increase of 15 per cent had indicated their willingness to do it. Secretary Schwellenbach asked that arbitration be based on the union's request for an additional 15 per cent increase. Most of the companies rejected this, declaring that arbitration should cover the range of zero to 30 per cent; in other words, should decide whether or not the 15 per cent offer was a fair and reasonable increase. The companies also insisted that the arbitration be with individual companies rather than on an industry-wide basis, and they asked a virtual pledge of an increase in ceiling prices if the arbitration award should call for a wage increase higher than 15 per cent.

Oil Strike Denounced and Defended

FOLLOWING are expressions from both sides in the controversy aroused by the strike of union oil workers:

Col. Harry T. Klein, president The Texas Co.—"The Texas Co. is disappointed that the union's action in violation of its contracts and in the face of the company's complete willingness to continue bargaining under the procedure established in the contracts with the union, has in the opinion of the United States Government, necessitated this unfortunate and drastic step. It represents in our opinion a definite setback in our ef-

Here Is What Was Taken Over by the Government

WASHINGTON.—Plants and facilities of companies engaged in the processing and transportation of oil throughout the country were included in President Truman's executive order for government seizure. The list is:

Ashland Oil & Refining Co., Catlettsburg, Ky.

Atlantic Refining Co., Atreco, Tex.

Canton Refining Division of Central Pipe Line Co., Canton, Ohio.

Chalmette Petroleum Corp., Chalmette, La.

Cities Service Oil Co. (Del.) East Chicago, Ind.

Cities Service Oil Co., (Pa.), Linden, N. J.

Crown Central Petroleum Corp., Houston, Tex.

Elk Refining Co., Falling Rock, W. Va.

Gulf Oil Corp., Port Arthur, Tex.

Gulf Refining Co., Toledo, Ohio.

Humble Oil & Refining Co., Ingleside, Tex.

Johnson Oil Supply Co., Gary, Ind.

Magnolia Petroleum Co., Beaumont, Tex.

National Refining Co., Findlay, Ohio.

Pan American Refining Corp., Texas City, Tex.

Pan American Pipe Line Co. (all pipe line facilities located in Texas, and related facilities).

Petroleum Specialties, Inc., Flatrock, Mich.

Phillips Petroleum Co., Kansas City, Kans.; Okmulgee, Okla.

Pure Oil Co., Cabin Creek, W. Va.; Midland, Mich.; Smiths Bluff, Tex.; Toledo, Ohio.

Republic Oil Refining Co., Texas City, Tex.

Shell Oil Co., Inc., Houston, Tex.; also combination 6-in. and 8-in. oil pipe line from Wood River, Ill., through Lima and Springfield, Ohio, to Columbus, Ohio, and related facilities; and 8-in. oil pipe line from Wood River to Chicago and related facilities.

Sinclair Refining Co., Coffeyville, Kans.; Corpus Christi, Tex.; East Chicago, Ind.; Fort Worth, Tex.; Kansas City, Kans.; Marcus Hook, Pa.; Sand Springs, Okla.; Sinclair, Wyo.; Wellsville, N. Y.; also all oil pipe-line facilities in United States and related facilities.

Socony-Vacuum Oil Co., Inc., Augusta Kans.; East Chicago, Ind.; Trenton, Mich.

Southport Division of American Liberty Oil Co., Texas City, Tex.

Standard Oil Co. (Ohio), Cleveland, Lima, and Toledo, Ohio.

Sun Oil Co., Toledo, Ohio.

The Texas Co., Houston, Tex.; Lawrenceville, Ill.; Lockport, Ill.; Port Arthur, Tex.; Port Neches, Tex., and West Tulsa, Okla.

The Texas Pipe Line Co., all petroleum pipe-line facilities in Texas in the South Texas division of the company and related facilities; and oil pipe-line facilities in Illinois and Indiana in the Illinois-Indiana division.

Union Oil Co. of California, Oleum, Calif.; Wilmington, Calif.

torts to develop harmonious relationships with our employes. This industry and this company have been in the forefront in the maintenance of high wages, liberal employe-benefit plans, short working week, and all the things that make for healthful and satisfactory remunerative employment. We shall cooperate with the Government. We shall continue to do the things which will build in spite of obstructionist tactics, the best possible relationship with the great mass of our loyal and deserving employes."

O. A. Knight, chairman of the union's executive council.—"It was the oil industry and not the union that refused to settle the dispute through arbitration. Seizure by the United States is an active retaliation against an industry which has always put profits ahead of the nation's welfare. There can be no final settlement of our differences with the oil industry until such time as industry is ready and willing to meet the just demands of the workers."

Harry C. Wiess, president Humble Oil & Refining Co.—"It would be the path of least resistance for the industry to accept the arrogant demands of labor and pass the cost on to the public. It has a public responsibility, however, to represent the interest of consumers in this case. The unions are virtually carrying out a holdup of the public and demanding that it give in to their display of force and accept all their demands without question. This is an intolerable abuse of the strike weapon and an affront to the public welfare. If the public does not stand firm at this time, it will forever more be at the mercy of irresponsible union force."

D. H. Byrd, president Independent Petroleum Association of Texas.—"The unions jumped the gun in the return to a 40-hour week. Instead of arbitrating, as called for by the contracts, they struck. It is commonly believed within the industry that the union jumped the gun because of the great speed of demobilization. The union wanted to win the strike before many of the war veterans returned. Behind the screen of the 30 per cent increase in salaries is a demand for a closed shop. This is one of the main objectives, with the salary increase, pay differential for various shifts, and rewriting of annuity plans, merely tossed in to confuse the issue."

Pan American Refining Corp. (company statement.)—"It is our considered judgment that any such increase as that demanded by the union would inevitably lead to large increases in prices throughout the country. We are not opposed to any reasonable adjustment which can be made without starting the inflationary whirlwind, provided it bears some relation to the necessities of the situation. This company will strive to hold any increase in wages to a sound and reasonable figure. The public interest is certainly not being served by the union's insistence upon inflationary increases or the dictatorial methods by which it attempts to enforce its demands in defiance of law and written contracts."

Average Refinery Wages

Bureau of Labor statistics show the average pay of refinery workers in May 1945 to have been: Hourly basic pay, $1.16; average hourly pay with overtime, $1.265; hours worked weekly, 47.5; take-home pay (weekly) $59.81.

OPA Names Advisory Committee

WASHINGTON.—The construction and related equipment section, Machinery Branch, of Office of Price Administration has formed an industry advisory committee for manufacturers of oil-field machinery and equipment. The following are being asked to serve on the committee:

Pacific Coast.—Hugh H. Glen, president Emsco Derrick & Equipment Co.; T. Sutter, vice president Baker Oil Tools, Inc.; M. E. Montrose, vice president Lane-Wells Co.; W. Sievers, vice president Security Engineering Co.

Gulf Coast.—Dow D. Warren, assistant to president Reed Roller Bit Co.; W. C. Trout, general manager Lufkin Foundry & Machine Co.; L. E. Hodges, manager Portable Rig Co.; H. D. McLean, assistant to president J. B. Beaird Co.

Mid-Continent.—H. W. Cardwell, president Cardwell Manufacturing Co.; J. H. Wilson, president Wilson Manufacturing Co.; P. E. Loye, president Reda Pump Co.; R. M. Vickers, president Hydraulic Pump Co.

Eastern.—A. M. McHinney, president National Supply Co.; F. J. Spang, president Spang & Co.; Geo. C. Alten, president Alten's Foundry & Machine Works; L. M. Ludlow, president Acme Fishing Tool Co.

The committee is expected to hold its first meeting at an early date in Washington. The meeting will be called by OPA officials, who will request the committee to elect its own chairman and other officers. Subsequent meetings may be called either by the committee chairman or by OPA.

The first meeting will be devoted to a general discussion of current problems. The committee may propose, vote on, and recommend any changes it regards as desirable in Revised Maximum Price Regulation 136, the general machinery regulation with which the committee will be concerned.

Although the committee will function in a purely advisory capacity, it will be in a position to acquaint OPA with facts, figures, and opinions not previously available to that agency. It is believed that any suggestions directed toward simplifying price control without tending to inflate prices will receive support.

Selection of the committee was in accordance with government rules calling for representation on the basis of size as well as geographical dispersion of the firms in the industry. Members are appointed as individuals rather than by firms, and each is expected to represent a certain segment of his industry.

WPB to Be Dissolved; New Agency Formed

WASHINGTON.—War Production Board will be abolished and its remaining reconversion functions centered in a new Civilian Production Administration, effective November 3, under an executive order issued last week by President Truman. J. D. Small, WPB chief of staff, will become CPA administrator when J. A. Krug, WPB chairman, resigns also on November 3.

CPA will be divided into five bureaus. New bureau chiefs and their functions are as follows:

Industrial reconversion operations: Walter C. Spruce will work with problems affecting scarce raw materials and products such as rubber, forest products, tin, lead, some construction textile and chemical materials, and various hard goods and equipment items.

Reconversion priorities: Lincoln Gordon will handle modification of general priorities and allocation controls, internal clearance of agency actions, appeals, inventory problems, compliance and liaison with other government agencies.

Field operations: Clarence A. Woodruff will direct field work including compliance activities.

International supply: Robert Turner will work with imports, exports, international allocations.

Demobilization: G. Lyle Belsley will handle the details of transferring WPB records, budget and other remaining affairs of WPB to other agencies.

THIS WEEK

ADVANCES—Synthetic tire superior to prewar type of natural rubber announced. . . . Wider tread, rolls more flatly. . . . Still better product promised when more natural rubber is available for blending. . . . ¶Jersey Standard plant producing 20,000,000 gal. alcohol from petroleum annually. . . . Can sell at 26 cents, compared with 70 to 90 paid for grain alcohol. . . . ¶Universal Oil Products Co. announces compact "cat" unit which puts latest refining technique within reach of small operators. . . . Means "revolution in refining and better gasoline world over." . . .

INTERNATIONAL—Army and Navy present "petroleum preparedness" program to Senate committee. . . . Designed to keep country "ready for third world war" if it comes. . . . Six-point plan offered to insure safety. . . . ¶Standard Vacuum's refinery in Sumatra, biggest in Far East, can't resume full operation for year. . . . Damaged by air raids, but hurt worse by ignorant Japanese management and neglect. . . . Speed of restoration depends chiefly on labor conditions and arrival of machinery. . . . ¶Government gets check for $4,085,327 from Mexico. . . . Installment on oil properties expropriated in 1938. . . . Leaves $8,170,654 to be paid. . . . ¶FEA definitely scheduled to terminate by January 1. . . . Export-control functions to be divided between State and Commerce departments. . . . All export controls to be dropped soon as practicable. . . .

PRODUCTION—Nation's daily crude output takes startling dive to 3,618,500 bbl. . . . Drop of 862,650 bbl. from previous week. . . . Texas experiences severest slump, with decline of 702,400 bbl., pretty evenly distributed through state's fields. . . . Eight other states register decreases, led by Illinois, with loss of 54,500 bbl. . . . Only state recording appreciable gain is Michigan, up 3,400 bbl. . . . ¶Week's completions 552, down 31. . . . ¶Humble's plans for 1945 comprehend total of 600 new wells. . . . Compares with 252 in 1943. . . . Drilling operations for second half of current year expected to average $6,000,000 monthly. . . .

PREDICTIONS—Dr. Robert Wilson: "I do not believe there is a reasonable probability of atomic power ever being used to run automobiles, though no scientist would say such a thing was impossible. In any case, the possibility of atomic power certainly cannot be disregarded." . . . ¶Dr. Gerald Wendt: "You cannot exaggerate the future of atomic energy." Predicts it will replace oil industry within next 10 years. . . . Warns 20-billion-dollar Texas oil industry to start reconverting to production of chemicals, textiles, dyes, perfumes. . . .

STRIKES—Navy takes over strike-ridden plants on presidential order. . . . Issue of wage increase unsettled. . . . Union head says "still on strike against companies" and fight for 30 per cent increase will continue. . . . May try to open wage negotiations directly with Navy on theory president's order confers full management rights, including authority to enter contracts. . . . ¶Companies characterize strikes as "holdup," "irresponsible union force," "attempts to enforce demands in defiance of law and written contracts," "screen to conceal demand for closed shop." . . . ¶Union says "oil industry, not union, refused to settle dispute through arbitration," "no final settlement until oil industry is willing to meet just demands of workers." . . .

TRANSPORTATION—Government fixes policy on shutting down of war-emergency pipe lines. . . . Little-inch to be drained and shut down because products in line will bring better price on spot market now. . . .

Blowing at the rate of more than 100,000,000 cu. ft. of gas daily, another new well in the giant Carthage field, Panola County, Texas, is cleaning itself into pits after being acidized preparatory to final completion. The camera in this shot caught the burst of flames as the vented gas, dried up enough to burn, was ignited with a torch thrown by the man at the right. The torch, visible in the haze of gas not yet ignited, has not yet had time to drop into the pit. The man's arm still is extended from the act of throwing. The well recently was completed by Chicago Corp.

Steady Increase in Total Demand Forecast at Senate Hearing

by Henry D. Ralph

WASHINGTON. — The best estimates of industry and Government officials regarding the future world demand for petroleum products were presented to the Senate petroleum resources committee at 2 days of hearings last week.

Chief witnesses were Dr. Robert E. Wilson, chairman of the board, Standard Oil Co. (Indiana); Stuart P. Coleman, director of the coordination and economics department of Standard Oil Co. (N. J.); and A. G. White, chief of the petroleum economics division, U. S. Bureau of Mines. Estimates of peacetime military and naval demand were given by Brig. Gen. H. L. Peckham and Capt. Lemuel P. Padgett, Jr., liaison officers for petroleum of the War and Navy Departments, respectively.

All the estimates were necessarily hedged by many uncertainties but they contained much statistical information of value to anyone desiring to forecast trends in the oil industry. The estimates presented by Wilson and Coleman were the result of conferences by a special committee of oil-industry economists appointed for the purpose, and they drew heavily on material which had been prepared for Petroleum Industry War Council. White explained that his figures differed somewhat in some details but in general were rather close to the industry estimates, and were drawn from material being compiled for a forthcoming official publication of the Bureau of Mines.

In general the forecasts predicted a steady increase in the total demands for all petroleum products in all parts of the world, both during the next 5 years and during the next 20 or more. There was also general agreement that other parts of the world in the future will draw their supplies less from the United States than before the war, and that this country may cease to be a net exporter of petroleum products on a large scale.

While some estimates were given regarding factors influencing supply and demand in other parts of the world, greatest attention was given to the domestic situation. Coleman's presentation contained forecasts of the number of automobiles which would be in use in various future years and the gasoline consumption per car. He also offered estimates of the probable future demand for various other petroleum products.

Wilson's presentation was less statistical and was devoted more to an over-all discussion of trends and other implications. He declared that whatever the growth in demand in the United States the oil industry will be able to fill all requirements if Government policies are such as to maintain the industry in a healthy condition and give it ample freedom of opportunity. Pointing out that scientific advance is certain to lead to more efficient methods of crude recovery and refining technology and to synthetic fuels from other sources if the crude supply fails, Wilson declared that the operation of a free price system can be depended upon to maintain a balance of supply with demand no matter what conditions are met in future years. He particularly stressed the importance of a sound import policy, defining this as one which permits the need of industry and individual consumers to be met at reasonable prices and yet not flood the market or keep prices at levels which would discourage exploration and efficiency.

White's prepared statement was confined largely to past trends in production and consumption in various sections of the world, though in oral questioning by the committee he commented at some length on the forecasts made by the industry witnesses, agreeing with them on all essential points. He discussed particularly recent trends in production of crude in the major oil centers of the world.

Peacetime Army requirements for petroleum products will range between 50,000 and 100,000 bbl. per day during the foreseeable future, or 10 to 20 times prewar consumption, the committee was told, while the Navy estimated its peacetime demand in the neighborhood of 190,000 bbl. per day of all products, or about seven times its 1928 rate of consumption.

Second Natural-Gas Hearing Opened

OKLAHOMA CITY. — Federal Power Commission this week opened the second of a series of regional hearings in its investigation of the natural-gas industry. The inquiry started with a 2-week hearing in Kansas City, where much valuable information was submitted to the commission. The examiners and staff were taken first for a trip through the three-state Hugoton gas field.

Sitting for the first time as a member of the commission is Harrington Wimberly, Altus, Okla., publisher. Nelson Lee Smith, acting chairman, is in charge of the hearing, with Marvin Farrington, examiner, and George Slaff, chief counsel, and his assistant, Frank Field.

Sam H. Jones, former governor of Louisiana and representative of the Louisiana gas conservation commission, arrived but said he probably would not participate in the hearing, except possibly to "ask a few questions" in cross-examination of witnesses.

Gov. Robert S. Kerr was scheduled to define the position of Oklahoma in regard to operation and regulation of the industry. The governor's statement was to be substantiated by Reford Bond, chairman of the state corporation commission.

Leading the state's witnesses was Walker T. Pound, chief conservation officer, describing the activities and administration of the conservation law.

Elmer Capshaw, natural-gas engineer; Dan O. Howard, state geologist; Lawrence Alley, chief clerk of the state's conservation department; George S. Cupit, chemist of the corporation commission, and Don McBride, chairman of the planning and resources commission, were in the list of witnesses. Problems of individuals and producers were to be handled by operators in the Guymon-Hugoton fields.

Merger of Canfield Oil With Sohio Proposed

CLEVELAND.—Canfield Oil Co., Cleveland refiner and distributor, will be merged with The Standard Oil Co. of Ohio if the proposed action is voted on favorably by stockholders, according to officials of both companies. Stockholders of Canfield will vote later this month on a plan under which Sohio would acquire virtually all of Canfield's holdings.

Terms of the prospective merger were not disclosed but reports are to the effect that Sohio offered a half share of its new preferred stock and three shares of its $10 par common for one share of Canfield common. It also was reported Sohio offered enough of its preferred to retire Canfield preferred.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

A National Research Foundation?

ANOTHER effort, of vital concern to the oil industry, has been made to push the federal Government further toward regimentation of scientific research. Vannevar Bush, at the request of the late President Roosevelt, undertook to set up a program of federal activities in studying (a) military security; (b) medical discoveries; (c) general reseach in private and public agencies; and (d) discovery and development of scientific talent in American youth. His report is a potpourri of fairly good and unquestionably bad.

Bush proposes, in effect, that the whole field of scientific endeavor be under direct governmental sponsorship. Some of his proposals are virtually adaptations of principles universally accepted. That military research must be highly scientific, must be a federal undertaking exclusively, and must be stepped up above prewar pace, all agree. Research in improving public health is so far-reaching and vital that only the federal Government can handle it properly. In spite of the numerous federal agencies already consuming public funds, it is possible that a science advisory board is needed to guide research plans. These are among the report's recommendations.

Constructive comments are made about our patent system. The patent laws "stimulate new invention and they make it possible for new industries to be built." Patent-system abuses should be corrected, for they "have led to . . . critical attacks which tend to discredit a basically sound system." Work of correcting these alleged abuses long has been pushed by a committee of scientists.

But the report implies, without possibility of mistaking its meaning, that the advantages of research in every field, carried out for decades chiefly by private enterprise, can be continued only by federal financing, management, and control. All research in Germany was directed with iron hand along a rigid plan, theoretically for the "betterment" of the whole German people. Careful scrutiny of records so far available shows that Germany failed to produce a single result in oil research which equals any of the developments of the American oil industry under a system of free and private enterprise.

One of the Bush report's specious arguments is that public health and well-being are proper concerns of government; that scientific progress is also a vital concern of government, and without scientific progress national health will deteriorate. Therefore, the Government must make this scientific progress, and without its direction no progress can be made.

The records of 150 years of scientific advancement refute such conclusions and make them look absurd. The most obvious indication of the totalitarian purpose of the report is shown by the provisions of a bill (S.B. 1297), one of four introduced by Senator Kilgore, to implement the report's recommendations. Kilgore proposes to push research in every field, patent all processes developed, license them without cost to any citizen desiring to license, placing the Government in direct competition with its taxpayers operating private research organizations. The Department of Justice would defend federal licenses against private parties in all infringement litigation, apparently without cost.

Government research in certain fields is most desirable. Government control of, or participation in, all research fields would be stultifying, throttling, completely incompatible with a republican form of government.

MIDDLE EAST REPORT *from the* EDITOR

Products of Industry's Largest Manufacturing Unit Have Most Widespread Distribution

by C. O. Willson

ABADAN, Iran.—The refinery of Anglo-Iranian Oil Co., Ltd., located here at the north end of the Persian Gulf, for years has been one of the oil industry's largest manufacturing units and now with a daily throughput of 360,000 bbl. rates as the largest single refinery by a substantial margin. It is also the largest in accumulated output, its crude runs to stills having passed the one-billionth-barrel mark in July 1943.

In describing the principal features of the refinery it has been necessary to convert many of the standard British designations for products, specifications, and nomenclature to American terms. Examples are the conversion of the Imperial gallons and tons to American barrels of 42 gal. and the use of A.P.I. gravity instead of specific gravity. The operations described are representative of present activities, which, as in every other major refinery, are subject to minor or substantial changes as conditions require.

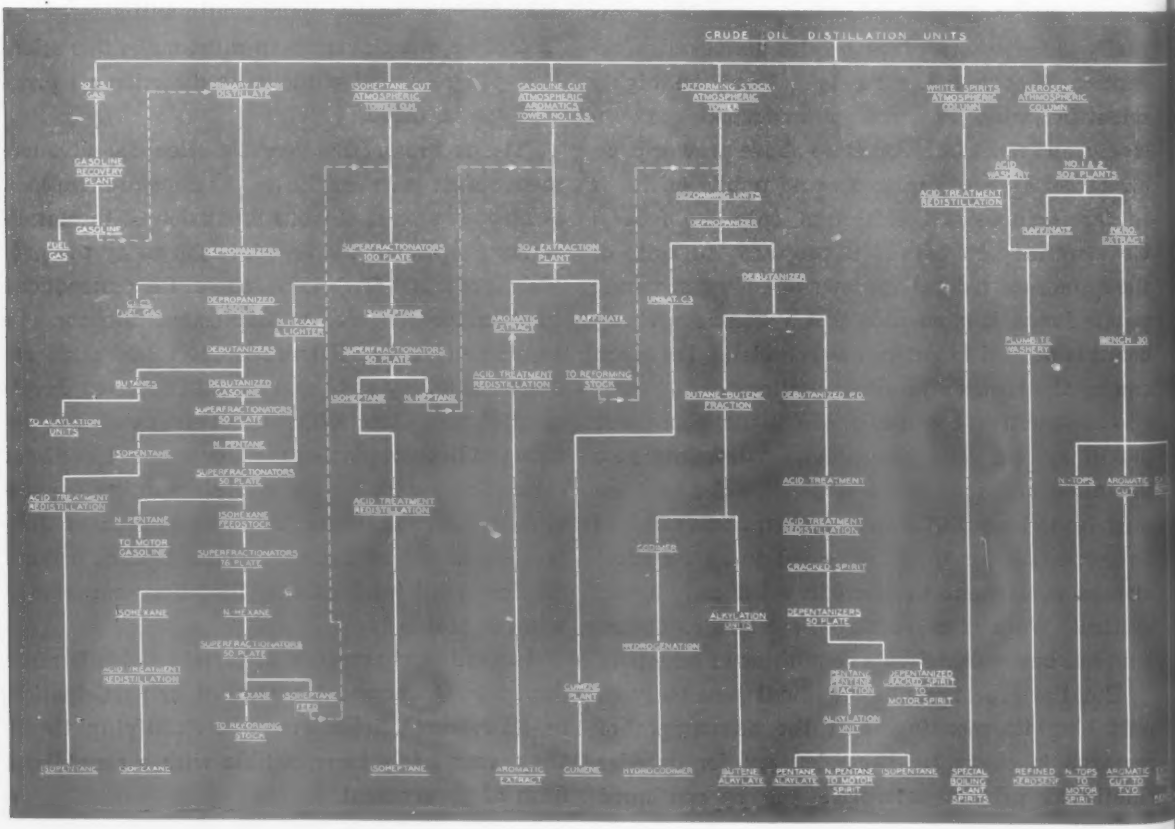
In appraising the operations of this refinery it is necessary to keep in mind that its products normally are distributed over a large part of Europe and the remainder of the Eastern Hemisphere. These products conform to the varying specifications of many countries. The refinery also manufactures products which serve a specific purpose and are limited in demand to one area. These basic conditions naturally are reflected in the main operations at this refinery.

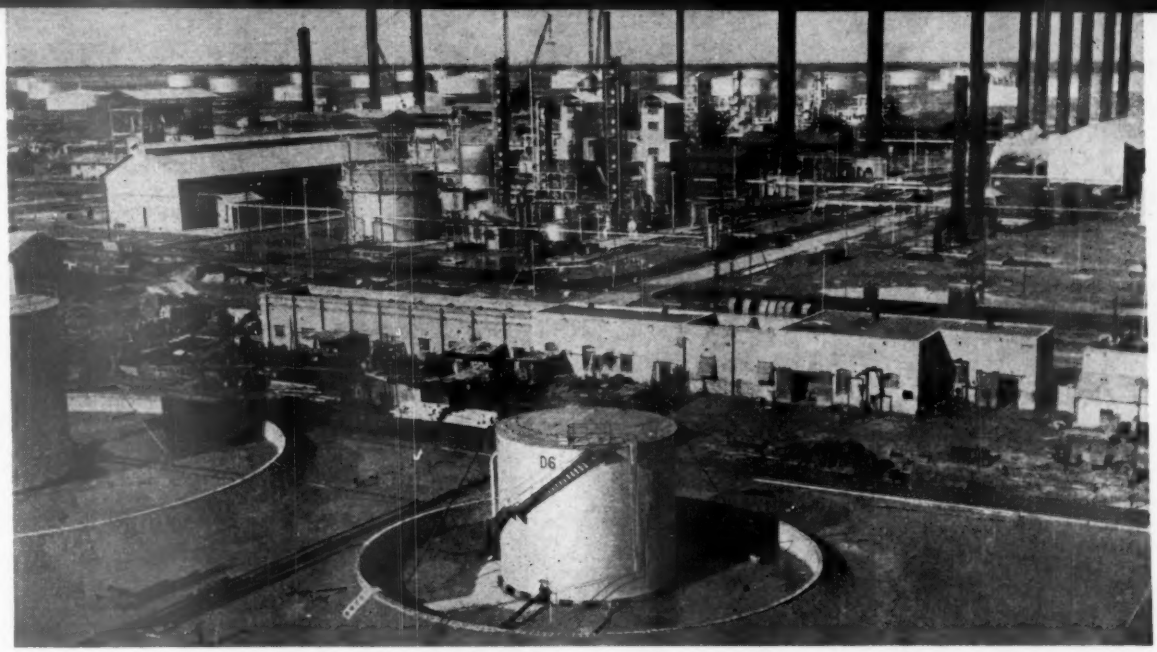
Previous to the war the refinery had been steadily expanded over a period of 27 years. New processes and auxiliary equipment were installed which could economically manufacture the products to serve old and new markets. With the start of the war this policy changed, civilian needs being secondary, to a program of securing maximum yields of military products.

Crude-Oil Units

The charging stock of the refinery is usually a composite stream from five fields of the company lo-

Refinery flow diagram at Abadan

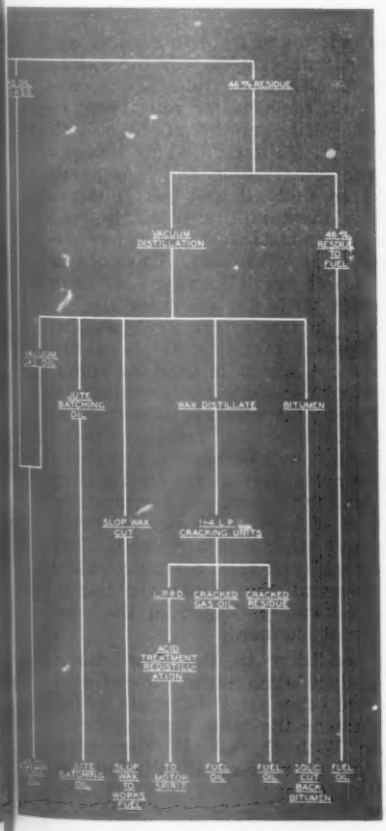


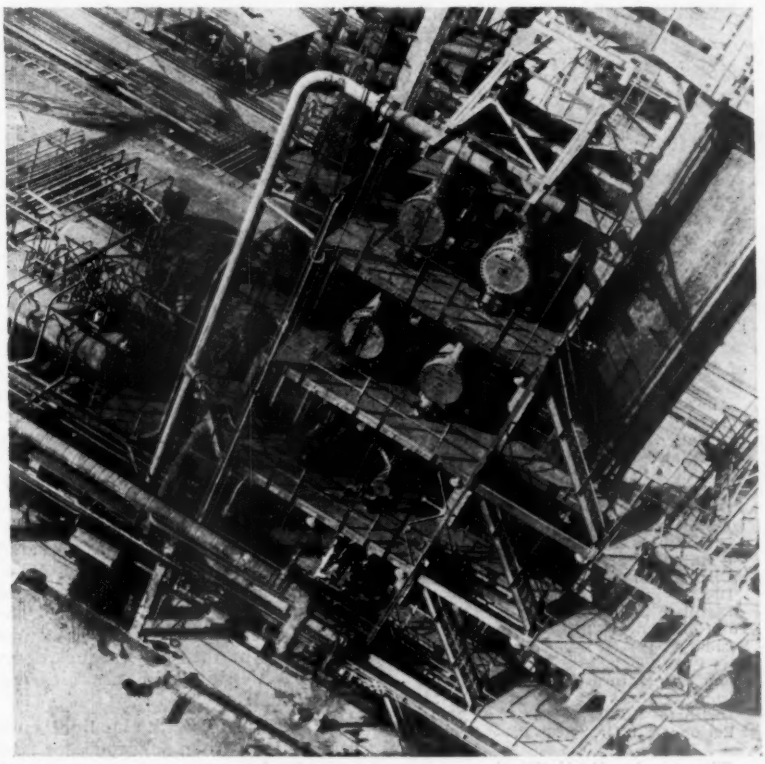


View of hydrogenation plant at Abadan refinery

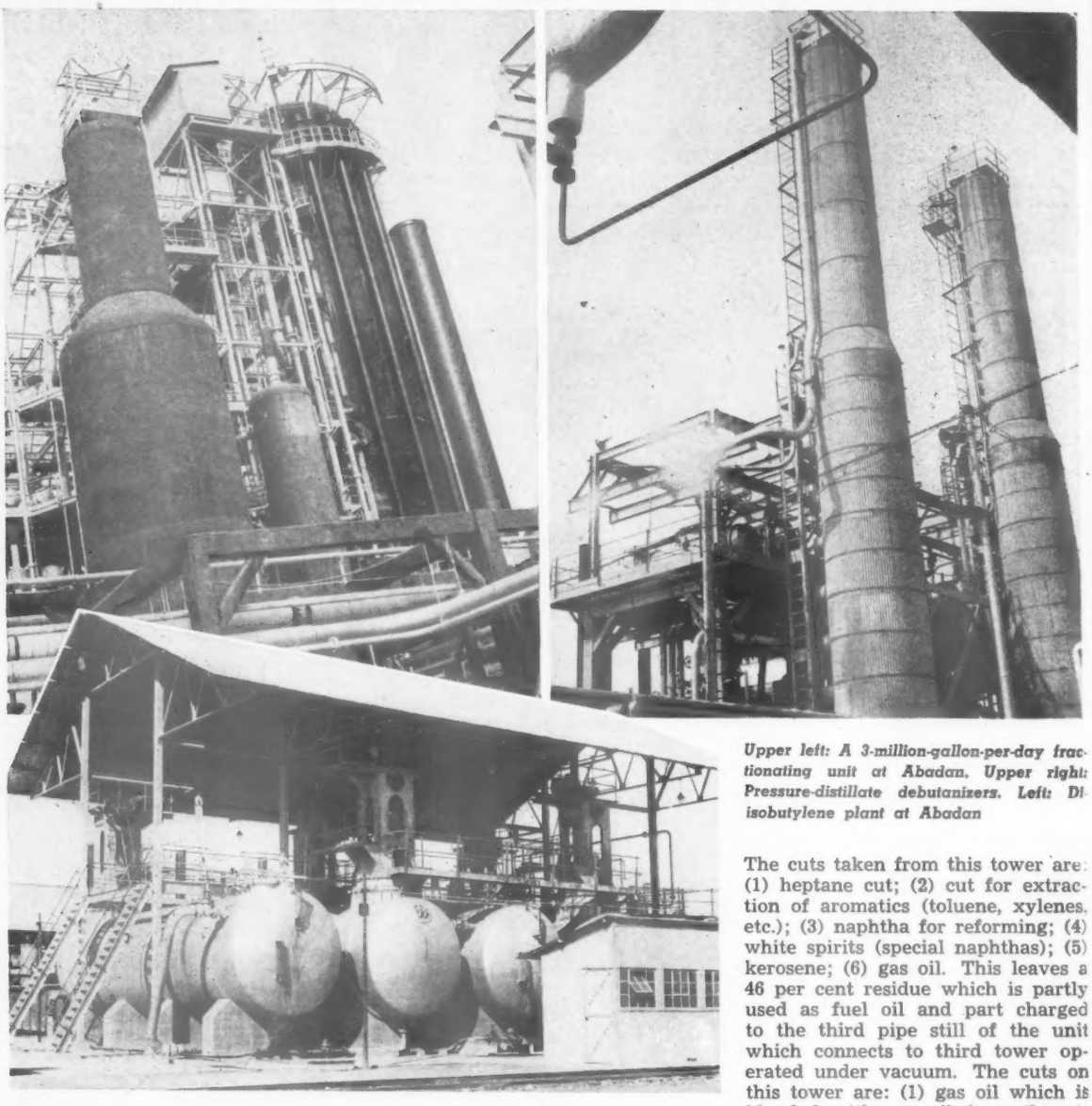
cated 100 to 175 miles from the plant. These fields are Masjid-I-Sulaiman, Haft-Kel, White Oil Springs, Gach Saran and Agha Jari. As now operated the light ends from these fields which were described in a previous article are made part of the crude-oil stream which arrives at the refinery at 10 lb. R.v.p. The refinery usually is so operated that the crude oil is charged directly to the crude-oil battery without first going to storage. The fields are operated so that the crude-oil delivered to the refinery is free of water.

The general plan of refinery operation is indicated in the accompanying diagram. In the carrying out of this program there are a large number of units of varying capacities and design segregated by districts in the plant layout to include crude-oil distillation, cracking and reforming, superfractionation, spe-





View of isomerization plant



Upper left: A 3-million-gallon-per-day fractionating unit at Abadan. Upper right: Pressure-distillate debutanizers. Left: Di isobutylene plant at Abadan

cial products, power plant and steam generation, packaging, and loading.

A representative distillation test of the crude oil follows:

Analysis—	Results
Sp. Gr. @ 60° F.	.8452
Distillation—I.B.P. (°C.)	47
Distillate to 75° C.	3.5
Distillate to 100° C.	8.5
Distillate to 125° C.	15.0
Distillate to 150° C.	21.0
Distillate to 175° C.	27.0
Distillate to 200° C.	32.0
Distillate to 225° C.	36.0
Distillate to 250° C.	42.0
Distillate to 275° C.	47.0
Distillate to 300° C.	53.0
Total distillate (%)	54.0
Residue (%)	45.4
Loss (%)	0.6
Room temperature (°F.)	86
Barometer (ins.)	29.64
Distillate—Sp. Gr. @ 60° F. = .7730.	
Residue—Sp. Gr. @ 60° F. = .9291.	

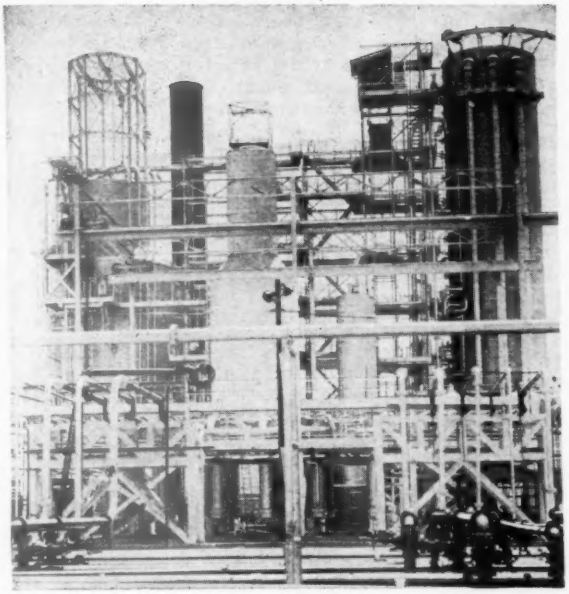
The crude-oil distillation centers in four units of Badger design each having a rated capacity of 85,000 bbl. daily. So far as the writer is advised the capacity of each of these units exceeds that of any other installation anywhere. The actual throughput will vary with the method of operation. All four units are similar in design.

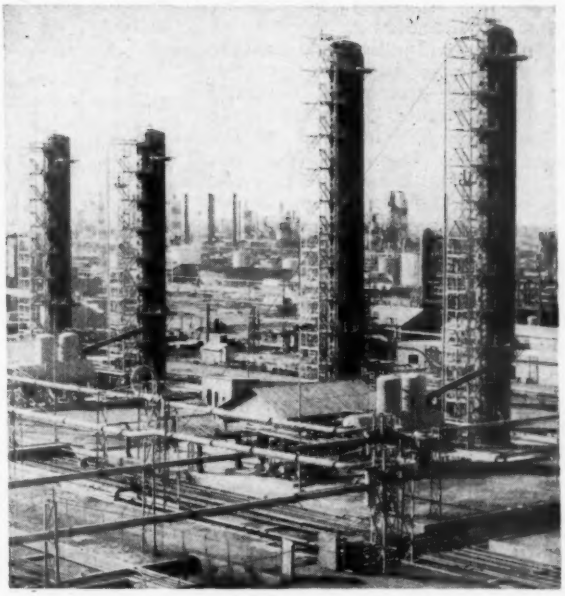
Charged to First Tower

The crude oil after preheating is charged to the first tower which is operated with a pressure of 50 to 60 lb. The C_1 to C_6 hydrocarbons are removed in this operation. The C_4, C_5, and C_6 were a major source of supply in the war-product operations. A pipe still provides reboiler heat.

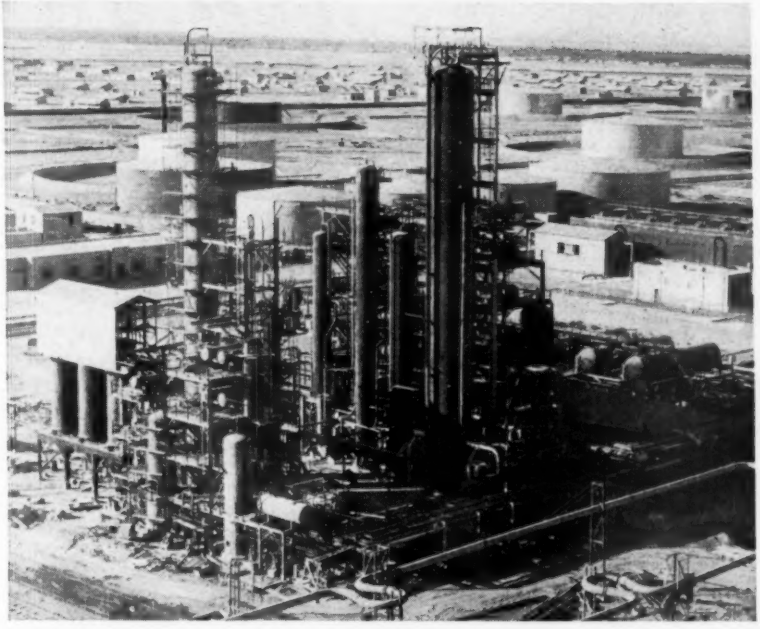
The crude oil with the light ends removed is then charged to the second pipe still and tower which is operated at atmospheric pressure. The cuts taken from this tower are: (1) heptane cut; (2) cut for extraction of aromatics (toluene, xylenes, etc.); (3) naphtha for reforming; (4) white spirits (special naphthas); (5) kerosene; (6) gas oil. This leaves a 46 per cent residue which is partly used as fuel oil and part charged to the third pipe still of the unit which connects to third tower operated under vacuum. The cuts on this tower are: (1) gas oil which is blended with gas oil from the atmospheric tower; (2) jute batching oil (special product); (3) wax distillate cut which is used as charging stock for viscosity breaking; (4) wax slops cut which is used as plant fuel; (5) asphaltic residual stocks. The company's demand for asphalts was considerably augmented during the war with demands for products used at airports, highway construction and other military needs. The "cut back" and solid asphalts (called bitumens at the plant) are manufactured and packaged in the conventional manner.

In addition to the four major crude-distillation units the refinery has five other crude-oil units which supplement the main topping operation. With these units the refinery has a crude-oil distillation capacity in excess of 400,000 bbl. daily.





Upper left: Another view of the fractionating unit. Upper right: Super-fractionating unit. Right: View of 3,000-bbl.-per-day alkylation unit



The refinery to date has been operated as a war plant without catalytic cracking facilities. In the thermal operations emphasis is placed on the reforming of light fractions extending through kerosene rather than the cracking of the various gas-oil cuts. This method has been used effectively in securing the charging stocks required for extensive alkylation operations.

The 10 units used in this service have a capacity of approximately 115,000 bbl. daily. Half of each of Nos. 1 to 4 units are available for cracking wax distillate. As previously explained the objective of this operation is viscosity breaking. One of these units is occasionally used to crack slops which accumulate from various sources.

What is termed the light charging stock consists of a wide naphtha cut and N-hexane residue. The heavy distillate stock usually consists largely of the kerosene cut from the crude-oil distillation operation. The following table summarizes the operation of these units:

	No. 1-4 H.P. units	Nos. 5, 6-8 units	No. 9 and 10 units
Feed stock	(†)	(‡)	(‡)
Temperature (°F.)	1,015	1,065	1,025
Pressure, psi.	250	200-230	900
Yield, P.D.	59	68	68
Yield of C_4	8	9.5	9.5
Isobutane in C_4 fraction Mol %	16 8	18.4	18.2
Total olefins in C_4 fraction Mol %	50.0	64.0	54.0
Octane No. of P.D.	70.0	67.0	71.0

†Heavy distillate. ‡Light distillate.

The depropanization, debutanization, and rerunning operations are carried out in units located elsewhere in the plant with the exception of Nos. 9 and 10 which have their own distillation equipment.

Several superfractionating units have been added over the past 3 years so that this phase of the refinery's operation is now complete for the stocks available. The details of this operation are not available at this time.

The three units in this operation devoted to isohexane have an approximate capacity of 40,000 bbl. daily. The four isoheptane units have a capacity of 50,000 bbl. daily. Two cracked-gasoline dependanisers have a capacity of 34,000 bbl. daily. There is also an intermediate distillation operation. Indicative of the size and scope of these operations the 14 columns operate with more than 650 plates.

Gasoline Fractionation

Several units are used in the fractionation of the primary gasoline cuts into hydrocarbon components. Some cuts are depropanized for fuel gas and the depropanized gasoline is then fed to debutanizers giving an overhead butane for alkylation and isomerization processes and debutanized gasoline which forms the starting material for the

production of isopentane and isohexane production.

In these and allied services which the refinery management terms "gas fractionator equipment" the refinery has 12 units, 7 of which are of Alco design, 2 Braun, and one Foster Wheeler with 2 Badger units building. The column heights vary from 38 to 110 ft. and the capacities range from 2,000 to 28,000 bbl. daily. The total capacity is approximately 125,000 bbl. daily.

Alkylation and Isomerization Operations

In the production of aviation gasolines the refinery relies heavily on the production from three alkylation units. A fourth unit which is almost completed is said to be the world's largest. The Nos. 1 and 2 butene units are of sulfuric type and operate in the conventional manner. These consist of four horizontal reactors per unit designed to contact isobutane, butenes and sulfuric acid. The fractionating columns operated with each unit consist of a saturated feed fractionator, iso-butane fractionator, depropanizer, debutanizer, and rerun tower.

The alkylation equipment includes a pentene unit. This was formerly on butene alkylation service. It has been modified by the addition of two horizontal reactors which are similar in design to those on the newer units. The cracked pentene feed is prepared by the fractionation of a light cracked-gasoline cut. The reaction temperature is maintained at 40°-45° F. by autorefrigeration.

A butene-pentene alkylation unit of large capacity will shortly be placed on stream. The unit is similar in design to the other installations except that indirect cooling is used. One half of the unit comprising two pairs of reactors carry on butene alkylation and the other half pentene alkylation. The unsaturated feeds are a cracked C_4 and a cracked C_5 cut.

Three isomerization units are in operation. Two units are linked to the two butene-alkylation units and a third unit is attached to the new b u t e n e-pentene alkylation unit. These units are operated so as to provide the balance of isobutane required, by the conversion of n-butane to isobutane, for alkylation requirements.

Polymerization

The company made important use of polymerization and hydrogenation processes in connection with the production of war components. A codimer unit is being operated and the resulting codimer hydrogenated. Cumene is produced, by the reaction of imported benzol with a propylene cut, in a polymerization unit used in conjunction with a series of fractionators from adjacent units.

SO_2 Extraction

Five SO_2 units are operated at the refinery and play an important part in preparation of finished products. The charge to two units is normally crude kerosene which is treated for the removal of aromatics. The extraction is effected at 20° F. by a counter-current wash of about 75 per cent volume liquid SO_2 carried out in two packed columns arranged in parallel. The two units have a capacity of 18,000 bbl. daily.

Two more units are used to treat naphtha cuts from the atmospheric column of the large crude-oil distillation units. A fifth unit is of recent design. It has a capacity of approximately 20,000 bbl. daily. Propane refrigeration is used in this unit.

Chemical Treatments

It is believed that in chemical treatments, the methods in use are, as far as the oil industry is concerned, peculiar to the company's operations. Extensive use is made of the Holley-Mott type of washery. This is a counter-current system in which advantage is taken of the difference in gravities of oil, chemical, and oil/chemical emulsions which promotes flow between paddle-agitated mixers and attached settling vessels. This type of treating plant is used in acid washing for sulfur removal and hypochlorite sweetening. Several of the units are designed to operate under pressure. Other more conventional methods are in use for mercaptan removal by plumbite and caustic soda treatments.

Chemical Manufacturing

Because of the wide variety of raw materials available at the refinery and in the fields the refinery has become an important manufacturer of chemicals all of which are used in the company operations. Two plants manufacture hydrochloric acid for isomerization, field use and also for descaling refinery cooling equipment.

Lime is produced by calcining sea shells, the plant having a production capacity of 25 tons daily. A C.C.C. unit is operated to recover sulfuric acid by decomposing acid tar in contact with hot coke. The SO_2 generated is freed from hydrocarbons and passes to a conventional contact sulfuric acid plant. There has recently been installed a second plant for the recovery of alkylation spent acid by dilution and concentration.

Sulfuric Acid Production

The refinery could be classified as a large manufacturer of sulfuric acid. Its six plants have a capacity of 264 tons daily. All units are contact plants using vanadium pentoxide catalyst. Part of the sulfur for these operations is obtained in sulfur manufacturing operations located at the refinery and at the company's oldest oil field. The hydrogen sulfide present in the crude oil is the base material of these operations. Part of the sulfur is imported.

The refinery packaging department includes equipment for practically all of the packaging operations found at a large refinery which in normal times distributes a substantial part of its light oil and special products in tins and drums. Two production lines have sufficient capacity to turn out 2,000 tins per hour. Practically all of the company's products leave the plant by water and loading facilities are extensive for all types of products

Utilities

In no part of the refinery are there better indications of the mammoth capacity of the refinery than in its steam-generation and power-plant facilities. Steam-generation plants are located in the power plant, cracking, and special-product areas A total of 63 boilers are operated with an hourly capacity of 4,750,000 lb.

Two main pump houses supply all process water for the refinery. Approximately 400,000 bbl. of water are required hourly for plant use. The source of the supply is a river which helps form the island on which the plant is located. Some of the water used in the plant is circulated through cooling towers for further use. Special pumping and treating equipment is provided for domestic water. The power plant consists of 10 units with a total capacity of 91,500 kwh. Numerous power substations are located inside the refinery and in the surrounding area.

Laboratory Control

With the large and numerous types of processing equipment laboratory control is the heart of the coordinated plant operation. These operations center in the main control laboratory located near the office building but there are several subsidiary laboratories which are connected directly with the various operations.

The laboratory includes a chemical and development department which is credited with important contributions to the refinery's operations in the form of new products and processes.

The refinery for the most part incorporates processing and operating facilities of British and American design. M. W. Kellogg Co. has had a large construction force here during the war period erecting installations designed by itself and other companies.

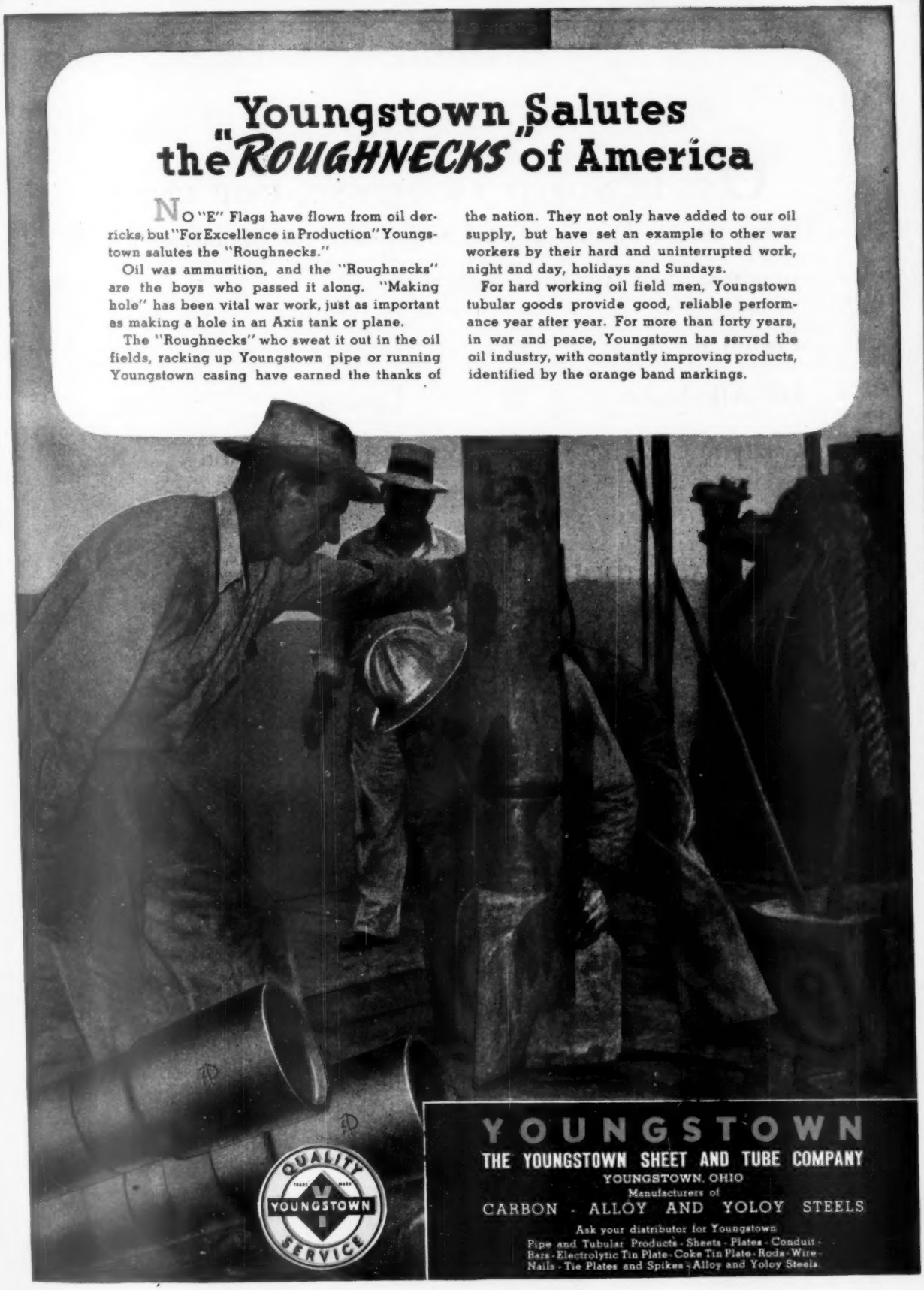
Youngstown Salutes the "ROUGHNECKS" of America

NO "E" Flags have flown from oil derricks, but "For Excellence in Production" Youngstown salutes the "Roughnecks."

Oil was ammunition, and the "Roughnecks" are the boys who passed it along. "Making hole" has been vital war work, just as important as making a hole in an Axis tank or plane.

The "Roughnecks" who sweat it out in the oil fields, racking up Youngstown pipe or running Youngstown casing have earned the thanks of the nation. They not only have added to our oil supply, but have set an example to other war workers by their hard and uninterrupted work, night and day, holidays and Sundays.

For hard working oil field men, Youngstown tubular goods provide good, reliable performance year after year. For more than forty years, in war and peace, Youngstown has served the oil industry, with constantly improving products, identified by the orange band markings.



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were designed, constructed and placed in operation for production of war-time fuels.

Codimer	56	Isomerization	13
HF Alkylation	28	Cumene	11
Catalytic Cracking	13	Dehydrogenation	5

The technique and know-how developed during the war in the research, design, and operation of these units together with that accumulated for many years before the war are now available for the post-war period.

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Hydrogen-Sulfide Corrosion Is Stopped, A.I.M.E. Group Told

by Charles J. Deegan

HYDROGEN - SULFIDE corrosion of subsurface equipment in wells in West Texas and Kansas has been absolutely stopped. This was the startling news brought to the regional meeting of the Mid-Continent section of the A.I.M.E. at Tulsa on October 8 by P. L. Menaul and T. H. Dunn, of Stanolind Oil & Gas Co.

Experiments in the Tobarg, North Cowden, and Iatan-East Howard fields in West Texas, over a period of 18 months, and in various Kansas fields for 10 months, have shown that daily injection of standard commercial grade 40 per cent aqueous formaldehyde into producing wells will completely stop all hydrogen-sulfide corrosion. The method is cheap, formaldehyde of this grade, selling for 30-35 cents per gallon, f.o.b. plant, being used once a day in quantities of 2 qt. per 100 bbl. daily salt-water production for 1 month, then reduced to 1 qt. per 100 bbl. daily salt-water production. It is simple, since the formaldehyde is introduced between the casing and tubing, by use of a simple lubricator or drip system.

The audience of 150 engineers expressed great interest, and many questions were asked.

The engineers were also informed that laboratory experiments, verified by field trials, indicated that present-day practices and state regulations as to the time period which must be allowed for cement to set when casing is run, are much longer than necessary, particularly in deeper wells. In a paper on "Method for Determining Minimum Waiting On Cement Time," R. Floyd Harris, also of Stanolind, presented data indicating that the average w.o.c. time for all wells is approximately 51 hours, whereas this could be reduced quite safely to approximately 15 hours. Assuming a conservative saving of 30 hours rig time per job, at $20 per hour, equals $600 multiplied by an average of two cement jobs per well, gives a potential saving of $1,200 per well drilled.

A. C. Bulnes, Shell Oil Co., Inc., Midland, Tex., presented a thought-provoking paper, "An Application of Statistical Methods to Data of Porosity and Permeability of Dolomitic Limestone". The theme of the paper was that possibly the use of some of the statistical analysis methods which had proved so useful in many war jobs, might be of some use in gathering the mass of somewhat inchoate data on porosities and permeabilities in dolomitic limestones into parameters which might reveal something significant. While the author had originally hoped to develop some relationship between observed porosities and probable permeabilities, he was unable to do so. However, the results did indicate that there are some significant relationships involved in the various parameters of permeability with probable porosities.

Immediate Usefulness Not Claimed

No claims were made of immediate usefulness, except that viewing the problems from this fresh point of view might throw some light on the general subject. Comparisons with similar data on sandstones showed that statistical methods develop results that check with empirical observations, in that it is obvious that the porosity-permeability relationships in dolomitic limestones are of an entirely different nature from those of sandstones.

For the benefit of those interested in the special field of porosity-permeability relationships and techniques of examination, Bulnes stated that a paper, "A New Technique for Determining the Porosity of Drill Cuttings", would be presented at the Houston A.I.M.E. meeting, and possibly the Fort Worth meeting, by M. A. Westbrook and J. F. Redmond, of Shell

H. G. Botset, Gulf Research and Development Co., Pittsburgh, presented an interesting paper on "The Electrolytic Model and Its Application to the Study of Recovery Problems". The electrolytic model is based on the close analogy of Ohm's law regarding the flow of electric charges with d'Arcy's law on the flow of fluids through a permeable body. By using electrolytic solutions in which color can be observed, a model can be used to simulate the conditions in an oil field. Model input and output wells are set up, and through a closely controlled current and colored electrolytes, photographic observations can be made of the theoretical flow of fluids as they will probably occur in the oil field under given sets of conditions. Various types of experiments can be performed to give theoretical answers in from 2 to 6 hours as a rule.

At the luncheon, which was a joint affair of A.I.M.E. and Engineers' Club of Tulsa, Harry P. Hohenadel, general superintendent, chemical division, Cities Service Co., Bartlesville, Okla., gave a talk on "Some Future Products From Synthesis of Petroleum and Natural Gas". Hohenadel touched on many synthetic products that are either being made, or can be made using natural gas or petroleum hydrocarbons as the raw material for synthesis.

Considering the future from the standpoint of synthetic products that would go into mass consuming markets, and therefore call for mass production, he considered the mass markets as based on the fundamental needs of food, clothing, and shelter. Then he listed the existing, or potential, synthetic chemicals from hydrocarbons that are or could be used in these fields in large tonnages.

Following the afternoon program, a dinner meeting was held, at which M. L. Haider, chairman, petroleum division, A.I.M.E., New York, gave a report on the affairs of the petroleum division and numerous changes that are being made, or will be made, to modernize the functioning of the organization.

The meeting was handled by the Mid-Continent section, with L. E. Elkins, chairman; W. B. Berwald, first vice-chairman; R. C. Earlougher, second vice-chairman, and H. M. Cooley, secretary-treasurer, in charge of the various arrangements. As the first of a series of regional meetings, it will be followed by a 2-day meeting of the North Texas section in Fort Worth on October 12 and 13, and a 1-day meeting of the Gulf Coast section in Houston on Monday, October 15.

Abstracts

Of Papers Presented At Tulsa A.I.M.E. Meet

Formaldehyde as an Inhibitor Of Corrosion Caused by Hydrogen Sulfide

P. L. MENAUL and T. H. DUNN, Stanolind Oil & Gas Co., Tulsa.

THE research department laboratory of the Stanolind Oil & Gas Co. has found that formaldehyde is remarkably effective in inhibiting hydrogen sulfide corrosion of iron and steel, both in the laboratory and in three West Texas fields where it was tried on producing wells.

Field tests show that usually in the proportion of 1 qt. of solution per 100 bbl. daily sulfur water production virtually stopped sulfide corrosion of subsurface equipment over a period of more than a year.

The solution is injected into the annulus between casing and tubing. After trying various injection methods, it was

found that a lubricator or drip system was the most satisfactory.

In some wells, while there was a notable reduction of corrosion, the results were not comparable with other tests. Investigation revealed that there was also electrolytic corrosion due to electrolytic currents in the flow lines and pull rod lines. Installation of an insulating flange in the flow line near the well head virtually eliminated this.

Three conclusions are drawn. One, that corrosion of subsurface well equipment by hydrogen sulfide can be almost entirely prevented by daily injection of an aldehyde, preferably formaldehyde, into the annulus of such wells. Second, that the inhibitor treatment does not prevent electrolytic corrosion resulting from electrical currents entering the well through flow lines, but that such corrosion can be stopped by installing insulating flanges. Third, that the aldehyde inhibitor treatment results in important net savings in operating costs.

An Application of Statistical Methods to Data of Porosity And Permeability of Dolomitic Limestone

A. C. BULNES, Petroleum Engineer, Shell Oil Co., Inc., Midland Tex.

POROSITY and permeability data of limestone cores from the Fullerton and Wasson fields of West Texas are examined from the viewpoint of statistics. The Fullerton porosity distributions, by wells, vary from zone to zone and in general depart from the normal form. The Wasson data show less variation in these respects. Permeability distributions are incomplete because a large fraction of the assemblages have values lower than are customarily reported, but they indicate similar variations and non-uniformity.

Distributions of permeability among cores of equal porosity appear to vary in a systematic and continuous manner as the porosity varies. The same is true of the porosity distributions of cores with the same permeability.

The Gram-Charlier series is employed to fit the distributions.

The Electrolytic Model and Its Application to the Study of Recovery Problems

HOLBROOK G. BOTSET, Gulf Research & Development Co., Pittsburgh.

THE electrolytic model method for studying recoveries from water flooding or gas recycling in condensate fields, gives in a few days at negligible cost moderately accurate qualitative comparison of the effect on recovery, of variation in distribution, and rates of operation of input and output wells. Edgewater encroachment may also be studied by this method.

Results from these model experiments represent highly idealized conditions. However, the pictures obtained in these experiments, when considered in conjunction with reservoir data, afford information obtainable in no other way.

Applicability of the model is based on the fact that Ohm's law and D'Arcy's law are exactly analagous, whence, electrical flow through a conducting medium may be used to simulate homogenous fluid flow through a permeable medium. If two electrodes are placed in a conducting (ionized) solution and connected to the positive and negative terminals of a source of direct current, the positive ions of the solution will move toward the negative terminal. Since the velocity of an ion in an electrolytic medium is proportional to the electrical gradient, just as the velocity of a fluid particle in a porous medium is proportional to the pressure gradient, the motion of the ions in the potential field will be the same as the motion of fluid particles in a porous medium if the positive and negative terminals (input and output wells) and boundary conditions are made equivalent in shape and distribution.

In order for the analogy to hold exactly, the sand must be assumed to have uniform porosity and permeability and the input and output fluids to have identical viscosities and densities.

To have the ions visible so that their motion may be observed, deep blue copper-ammonium ions represent input fluid, while sand is represented by an agar gelatin solution containing colorless zinc-ammonium ions which have the same mobility as copper-ammonium ions so that the two ions represent two fluids of equal viscosity.

The model consists essentially of a transforming-rectifying system for converting 110-volt alternating current to any desired voltage direct current up to 1,000 volts. The Variac controls the primary voltage of the transformer. Capacities and inductances are for the purpose of evening out ripples in the full wave rectified alternating current. Overload switch opens main current in case of accidental short or other high current demand. A clock measures elapsed time.

Provision is made for 20 wells, each with its own milliammeter and each being individually controlled by a 20,000-ohm rheostat and a switch of double-pole-double-throw type arranged so that each well may be either connected to the positive or the negative side of the circuit.

Method for Determining Minimum Waiting on Cement Time

R. FLOYD FARRIS, Stanolind Oil & Gas Co., Tulsa.

A METHOD is presented for determining minimum waiting on cement time which takes into account the differences that exist between types and brands of cements and such individual well conditions as depth, temperature, and pressure.

The basis for the method was determined by laboratory tests. Being a laboratory development, several steps were required to prove its merit. The first step consisted of laboratory tests designed to determine the minimum cement strength requirements in wells.

Basis was found for setting a minimum value of 8 psi. tensile strenth. Next, it was shown by laboratory tests that the time to 8 psi. tensile strength may be expressed as a function of consistometer stirring time to 100 "poises", the approximate relation being "the time to 8 psi. tensile strength equals the time to 100 'poises' times three." Next, it was shown that the time of maximum temperature development in cement slurries, due to heat of hydration, is also related to consistometer stirring time to 100 "poises" but only by a factor of approximately two.

It was shown also that the shutin casing pressure will build up after cement is placed and register a maximum pressure at approximately the same time the slurry down the hole attains maximum temperature. From this and the above relationships, the general rule was established that minimum waiting on cement time (time to 8 psi.) after casing cement jobs in any well is equal to the time when the shut-in casing pressure reaches a maximum, as measured from the initial mixing of cement, times a factor of 1.5.

Cement plugs drilled in the field at the time prescribed by this formula were found to drill "firm to hard", thus confirming the laboratory tests.

These tests prove that many of the present waiting on cement time regulations require longer time than is absolutely necessary. Use of the method here in proposed offers the possibility of a saving of $1,200 per well.

Some Future Products From Synthesis of Petroleum and Natural Gas

H. P. HOHENADEL, General Superintendent, Chemical Division, Cities Service Co.

THE expansion of the chemical industry during the past 25 years has been enormous. There are four significant trends in the chemical industry that are of importance to the petroleum and natural-gas industry, particularly in the Southwest. First, many of the recently developed chemical products are new creations, not substitutes. Second, many of these products will enter the mass consuming markets, requiring enormous tonnages. Third, most of the processes involved in producing these chemicals are adaptable to the use of natural gas, oil, or refinery gases as raw materials. Fourth, the relative purity of petroleum hydrocarbons makes them ideal synthesis stock and is attracting the chemical industry to the Southwest. Properly exploited and cultivated, a wide variety of companion and complementary fabricating industries can be built up here.

Mass consuming markets depend on meeting one of the three fundamental needs of men, food, clothing, or shelter. In food, there is little need for synthetic chemical products. In clothing, after several thousand years of no change, mercerizing cotton by mild alkali treatment was discovered 150 years ago, and rayon, the next step, reached commercial development about 1911. During the past 10 years new developments have been so numerous it would require hours merely to describe the new field of synthetic yarns, fibers, and textiles that will soon appear, to say nothing of the modifications of cotton and wool. In modifications of textiles, various types of resins made from formaldehyde, derived from natural gas, are proving ideal for production of shrink-proof woolen goods, water repellent cloth and wrinkle-proof dress fabrics.

In the field of shelter, synthetic chemical products will be required in large tonnages to meet two new developments. First is the development of new bonding agents and adhesives. New plywoods using these bonding agents are not only stronger, and waterproof, but in addition, by use of new metal bonding adhesives, can be worked with stainless steel, aluminum and other metals to add structural strength. New adhesives mark an enormous step forward. Man's progress in binding agents has been from leather thong, to wire nail, to bolt and screw to rivet, to welding metals. At least three new adhesives are available, which particularly in joining thin metal sections to heavier reinforcing sections, are said to give results superior to riveting and equal to welding.

Use of the chemicals urea and dimethylolurea to impregnate, or to case-harden only the surface, of soft southern pine give it properties that hitherto have been found only in the naturally hard woods. This opens up vast possibilities for furniture stock, and for construction purposes hitherto impossible.

Houdry engineers improve fixed-bed design —*cut time of catalyst change 80%*

At Houdry we never admit we have "perfected" a process. For science denies anything is ever so good it cannot be made better. Thus, even while the remarkable record of Houdry fixed-bed units made refining history in the war (and before!), the very preeminence of their performance challenged Houdry engineers to surpass it.

We are proud to report a significant improvement in the design of Houdry fixed-bed cases—the latest evolution of the oldest commercial catalytic cracking process. By means of this improvement, the time required for catalyst change has been reduced approximately 80%. In fact, in redesigned cases now in operation by a Houdry licensee, catalyst has been removed in 24 hours!

The results are higher on-stream efficiency and shorter shutdown periods, plus contingent improvement in both yield and quality of products. It all adds up to substantially greater profits from Houdry fixed-bed units. Details will gladly be furnished to interested refiners.

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HOUDRY CATALYTIC PROCESSES
FOR VICTORY IN WAR
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HYCAR

slush pump valve inserts outlast other types 5 to 10 times!

Photo courtesy American Iron & Machine Works Co. Hycar parts by Texas Rubber & Specialty Corp.

Hycar's high abrasion and oil resistance greatly reduce replacement and maintenance costs

IF it isn't the toughest job in the oil fields it will do until the toughest one comes along. Valve inserts in a slush pump have to operate continuously during the drilling of a well—in a mud that's practically a grinding compound made up of sand, shale, sandstone, granite, quartz or other abrasives—where oil and gas may be present part or all of the time—where consistently high temperatures prevail—where working pressures range as high as 825 pounds psi (test pressures run as high as 3000 pounds psi). During all this, the insert has to stay resilient and maintain a positive seal to insure steady circulation of the drilling mud.

But it's the kind of job that's made to order for Hycar. Hycar's unusual inherent properties—shown in the box at the right—make it possible for valve inserts made from Hycar to outperform inserts made from natural and other synthetic rubbers by *5 to 10 times.* That means money saved and time saved, important and practical considerations in any job.

These properties of Hycar tell why Hycar has become practically the standard resilient material inthe petroleum industry—for seals of all kinds, hose, mud gate packers, blowout preventers, and dozens of other important uses. Ask your supplier for parts made from Hycar. Test them in your own applications—difficult or routine. You'll learn for yourself that Hycar is the material to use for dependable, long-time performance. *Hycar Chemical Company, Akron 8, Ohio.*

WHAT HYCAR DOES IN OIL FIELD APPLICATIONS

1. *Resists oil and gas—even under high pressures and temperatures.*
2. *Resists action of abrasive-laden fluid under high pressure and at high velocity.*
3. *Wears at slow rate even under worst conditions.*
4. *Makes a positive, leak-proof seal, even after a long period of service.*
5. *Provides high elasticity.*
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7. *Has minimum tendency to cold flow and compression set.*

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Synthetic Rubbers

Bohart Tells Contractors Major Task Is Finding New Reserves

OKLAHOMA CITY.—The major task of the petroleum industry is to find much larger volumes of new reserves than it has been finding for the past several years, Phil H. Bohart, director of production, Petroleum Administration for War, told the American Association of Oilwell Drilling Contractors at its fifth annual convention here, October 1 and 2. This will be necessary, he said, to build up and maintain a cushion of productive capacity over market requirements.

"When we entered the war," Bohart pointed out, "the United States had an efficient productive capacity of about 1,000,000 bbl. above the daily rate of production. During the war it was necessary to call on all this reserve, and also to 'go into the red' by exceeding the maximum efficient producing rate of many fields.

"Recent reductions in withdrawals have tended to put the industry back into a more nearly normal state, but hardly to the position attained prior to the war.

"If we are to regain the favorable margin between production and efficient productive capacity we had before the war, the industry will have to increase its efforts considerably. If we just maintain the present position, we must find reserves at least as fast as they are depleted.

"A prerequisite for this is an active drilling campaign. Finding and development of new reserves of large magnitude requires much planned, intensive and searching effort, and the drilling of a lot of exploratory and development wells."

The more wells the industry can afford to drill, the better will be its chances of regaining its former position, Bohart emphasized.

Bohart reiterated the trends in production and reserves as a background to his comments concerning the present and future position of the industry.

"From a low point of 3,500,000 bbl. during the second quarter of 1942, daily production of the country," he recounted, "reached a peak of 4,890,000 bbl. to meet war demands. Shortly after August 14, the end of the Japanese war, the Army, Navy, and Shipping Administration cut its estimates of crude requirements for the first quarter of 1946 by 800,000 bbl. daily."

An expected increase in civilian requirements during the first quarter of 1946 is expected to take up about half (400,000 bbl.) of the 800,000-bbl. cut in estimated Army, Navy and shipping requirements, Bohart said. To offset the remainder of the cut and balance production with demand, it is necessary, he explained, to curtail domestic production 350,000 bbl. and foreign production 50,000 bbl. daily.

Bohart also said that Army and Navy estimates of requirements for the first quarter of 1946 are tentative, and may be altered within a few weeks, and that civilian demand might be different from now anticipated. If Army and Navy estimates are reduced and civilian requirements fall short of the above figures, it may be necessary to curtail production further, he warned.

There have been various estimates of crude requirements for 1946 which would necessitate cutbacks in production ranging from 400,000 bbl. to 1,000,000 bbl. daily, he continued.

"If the cutback is less than 1,000,000 bbl. daily, the struggle to maintain a favorable position will be intensified, and wildcat exploration and development will have to be accelerated greatly," he declared.

Bohart brought out the fact that a reduction in number of barrels produced per day means a reduction in income without corresponding reduction in expenses unless there is a price increase large enough to make up the difference.

"This will result in a tendency to curtail operations," he predicted. "Complicating the program is the fact that new oil is becoming more difficult to find and as difficulty increases cost of finding increases."

A reduction in drilling costs and introduction of new and improved techniques will help materially in making possible the drilling of a great many more wells and assist the industry in regaining its former good position, he declared. This he issued as a "challenge" to drilling contractors.

"The problems of finding more oil and drilling more wells cannot be resolved until general economic conditions reach some plane of stability where there is a reasonable balance between income and expense," he said. "Until operators are able to determine what their position is going to be during and after the period of reconversion there will be a tendency to curtail and reduce the drilling rate."

Other discussions and news of the drilling contractors' convention were covered in the October 6 issue of The Oil and Gas Journal, page 84. In addition to the new officers listed in that issue the following new directors were elected to fill vacancies or augment the directorate: Regional directors: Ralph W. Marshall, Los Angeles, Pacific Coast region; M. W. Blair, Wichita Falls, North Central Texas; J. Zeppa, Tyler, Tex., and J. I. Roberts, Shreveport, Cretaceous and Tertiary basins; Will I. Lewis, Mount Vernon, Ill., North Central Paleozoic Basin; Guy Mabee, Midland, Tex., and C. M. Ashby, Dallas, Permian basin; Harry S. Connelly, Wichita, and George Lang, Tulsa, Central Mid-Continent and Rocky Mountain region. Directors-at-large: George P. Livermore, Lubbock, Tex.; F. L. Carmichael, Evansville, Ind.; J. K. Butler, Houston; Warren S. Churchill, Tulsa; Travis M. Kerr, Oklahoma City, and A. S. Hayes, Los Angeles.

Some of the newly elected officers of the American Association of Oilwell Drilling Contractors. William T. Payne, Big Chief Drilling Co., Oklahoma City, president; J. E. Warren, Carl B. King Drilling Co., Midland, Tex., vice president at large; George P. Livermore, Lubbock, Tex., vice president for West Texas and New Mexico; F. L. Carmichael, Delta Drilling Co., Evansville, Ind., vice president for Illinois, Michigan, Indiana, and Kentucky; and H. C. Milhoan, Milhoan Drilling Co., Tulsa, vice president for the Central Mid-Continent and Rocky Mountains

Ells to Take Position With United Carbon

Harry A. Ells, manager of the natural-gasoline and chemical division, Cities Service Oil Co., Bartlesville, Okla., will leave that position November 1 to head the Kansas-Oklahoma activities of the United Carbon Co., Charleston, W. Va., at its new offices being established at Liberal, Kans.

Ells has been in Cities Service employ since 1923 when he worked on a gasoline construction gang for the company shortly after his graduation from Stanford University as a mining engineer. He was placed in charge of plant construction in 1926, became operating superintendent in 1931 and general superintendent in 1937. It was in 1940 that he assumed the position from which he has just resigned. He has been active in the affairs of the natural-gasoline industry as a whole and as a director of the Natural Gasoline Association of America, of which he has been vice president for the past 3 years.

Companies Lift Pipe-Line Proration in West Texas

MIDLAND, Tex. — Humble Pipe Line Co., Magnolia Pipe Line Co., Stanolind Pipe Line Co., and Atlantic Pipe Line Co have resumed buying of crude oil in the West Texas area to their full allowables. Shell Pipe Line Co. continues to restrict its purchases in West Texas and New Mexico, taking only 70 per cent of the allowed production of all grades of crude in the Permian basin. The reduction became effective October 1 and will continue until further notice.

During September, Shell took 88 per cent of the allowed production, shutting down its 10-in. pipe line to Houston. Its system to Wood River, Ill., still is operating and purchases are being made for this system.

Synthetic Tires Declared Superior to Prewar Type

CHICAGO. — An automobile tire made of 99.8 per cent synthetic rubber, which it is declared will outwear prewar tires of natural rubber, is announced by B. F. Goodrich Rubber Co. The most important advance marked by the new tire, according to the company, is the tread, which is wider and rolls more squarely and flatly along the pavement. The increased "contact area" is said to afford greater stability, better distribution of weight, and less scuffing of the tread.

In the synthetic rubber developed by Goodrich engineers and called GR-S-10, a rosin-base soap replaces a fatty-acid soap as mulsifying agent, and this is a factor in attaining better wear, cooler running and greater resistance to cracking and carcass bruising, according to A. C. Kelly, district manager.

Rigorous tests are said to have proven the synthetic tire would give more service than natural-rubber casings. Even greater improvements are expected in the future when more crude rubber is available for use with the synthetic.

The new tire will comprise 15 per cent of the company's October production, 30 per cent in November, and 75 per cent in December.

DEATHS

William H. Moreland, 53, oil executive with the Benedum-Trees interests for the past 25 years, died September 27 in Dormont, Pa., Pittsburgh suburb. Moreland was secretary-treasurer of Republic Oil Co., Republic Oil Refining Co., Republic Pipe Line Co., Duvall Gasoline Co., Duvall Pipe Line Co., and Husky Transit Corp.

Noah Lovell Harman, 68, former oil operator in the Nevada County fields of Arkansas, died September 30 in Shreveport.

Harry C. Tyrrell, 70, oil producer, philanthropist, and civic leader, died October 5 in Tulsa. He had holdings in Oklahoma, Texas, and Kansas. Tyrrell, in 1929 voted Tulsa's most useful citizen, was a cowboy in South Dakota as a young man, and then for 9 years was a farmer in Iowa. In 1907 he and his father, the late Col. W. C. Tyrrell, formed Pulaski Oil Co. in Oklahoma. From that time his petroleum ventures were almost uniformly successful. He received the degree doctor of humanities from University of Tulsa in 1931. Tyrrell Hall, fine arts building on that institution's campus, was among his benefactions.

Lewis Jones, Jr., 76, engineer, among the first to experiment with gasoline as a motor fuel, died September 29 in Amsterdam, N. Y. Jones invented an electrically driven automobile, and 50 years ago he toured New England in a car operated by storage batteries. Later he made several transcontinental trips in a gasoline-operated car of his own design.

Sir David Milne-Watson, 76, expert in gas and associated industries, died October 3 in Abbotsbury, Dorset, England. He had served as president of National Gas Council, chairman of Federation of Gas Employers, and was a member of the Government Department of Scientific and Industrial Research.

Gilbert M. Ramsey, 54, architect and designer for Shell Oil Co., Inc., died October 2 in New York. He had designed Shell's service stations for more than 10 years and introduced a building made solely of structural glass and steel. He graduated from Harvard School of Architecture in 1910 and from Columbia School of Architecture 2 years later.

William D. Bryan, 71, who, as a drilling contractor, put down some of the deepest wells in the Cushing and other Oklahoma pools, died October 6 in Tulsa. Bryan entered the oil business in 1912, leaving it in later years to engage in various activities, including operation of the hotel in Tulsa which bore his name.

Frank Chiodo, 63, pipe-line contractor, died October 3 in Bradford, Pa.

Joseph M. Atwell, former manager of the production department of Standard Oil Co. of California, died September 30 in Los Angeles. Atwell, who supervised installation of pipe lines from Bakersfield to San Francisco, retired from the company 13 years ago.

J. Benson Wrenn, 78, Kern County, California, oil producer, died October 2 in Los Angeles.

Albert Taylor, 76, owner of extensive oil properties in the vicinity of Montebello, Calif., died October 1 in that city. He was a pioneer in oil development of the Montebello area.

Cyrus Pierce, 72, under whose direction the smaller gas companies of California were consolidated into Pacific Gas & Electric Co., died October 3 in Los Angeles. He organized Southern California Gas Co., San Joaquin Power & Light Co., and Caterpillar Tractor Co.

Clarence F. Succop, 57, president and director of American Roller Bearing Co., Pittsburgh, died October 4. Succop, who graduated in electrical engineering from Union College, was connected with General Electric and Western Electric companies until shortly before founding American Roller Bearing in 1914.

George Edwards Glines, 76, former general manager of Eclipe Oil Works of Atlantic Refining Co., died in a hospital in Franklin, Pa., following an illness of several months.

Michael O'Neill, 77, head of the brick-construction department of Magnolia Petroleum Co.'s refinery in Beaumont, died October 4.

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Seamless Casing and Tubing
J & L Integral-Joint Drill Pipe
Line Pipe Wire Rope

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Quality Control, through every step of manufacture, insures that J & L Seamless Casing and Tubing will give you leak-proof strings right from the start.

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JONES & LAUGHLIN STEEL CORPORATION

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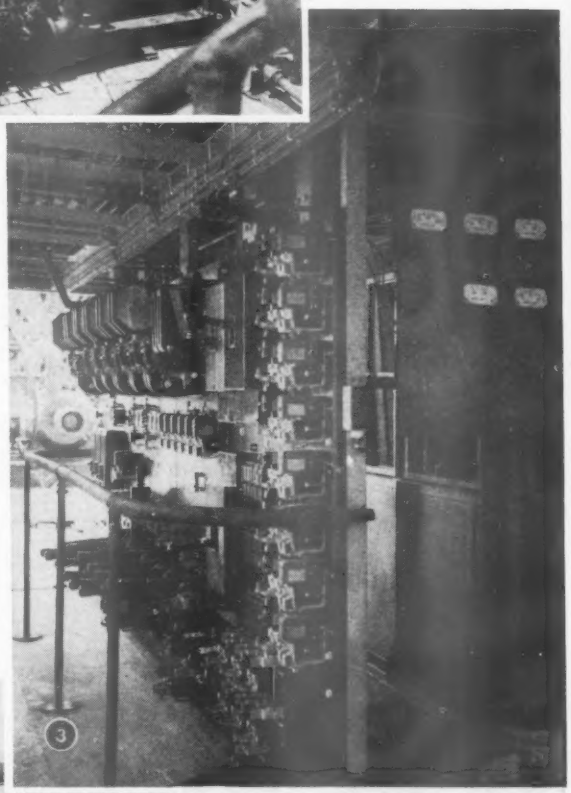
Rowan Initiates Diesel-Electric

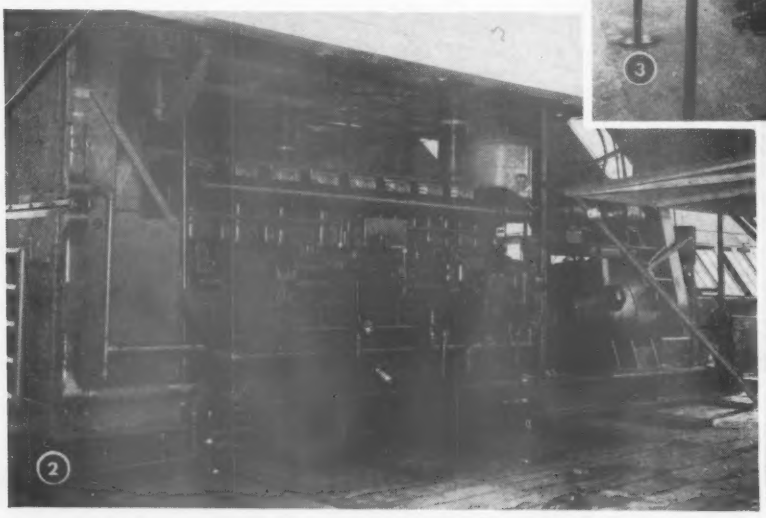
by E. H. Short, Jr.

THE diesel-electric knowledge gained by Rowan Drilling Co. during 8 years of experience with this type of rig has been utilized in the layout design of the company's newest diesel-electric rig, now drilling on a Quintana Petroleum Co. lease 6 miles northwest of Gonzales, Tex.

During the past month, the Rowan rig has been inspected by many engineers, contractors, and equipment manufacturers from various parts of the Greater Coastal area, and characteristic reactions concerning this rig are to the effect that it is perhaps the most up-to-the-minute diesel-electric rig in the country.

An inspection of the Rowan rig indicates that maximum power, unfailing dependability, flexibility, safety, and installational efficiency were considered of prime importance by the Rowan superintendents and engineers who contributed to the layout design and selection of equipment. This rig was assembled specifically for deep drilling in areas where gas and water are not readily available, but company figures on this type of rig indicate that it can be used as economically as other types of rigs even on locations where water and gas are plentiful.





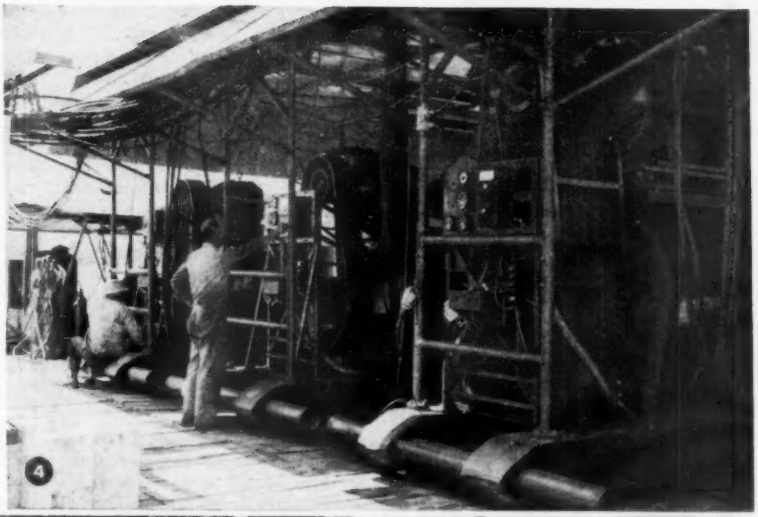
1—View from engine substructure showing mud pumps in foreground, electrical control house in center, and three Cooper-Bessemer Westinghouse power units in background. At left of power units is auxiliary house containing air compressor, arc welder, washdown pump, and light generator

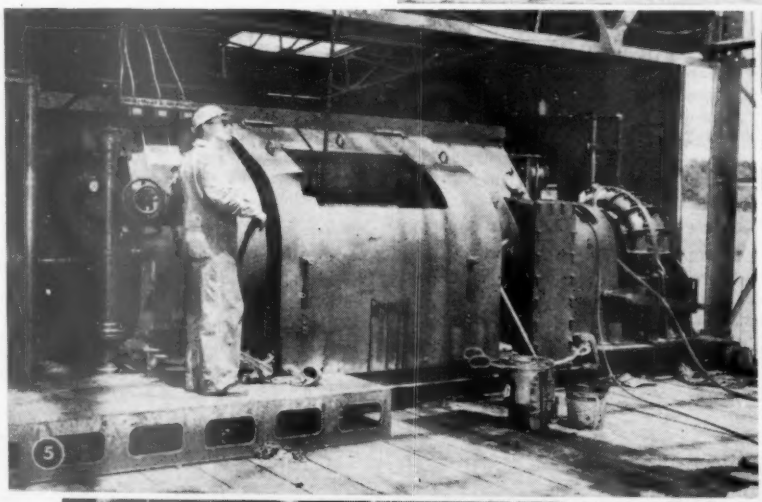
2—View of 650-hp. 8-cylinder-in-line Cooper-Bessemer Westinghouse 400-kw. variable-voltage direct current generator

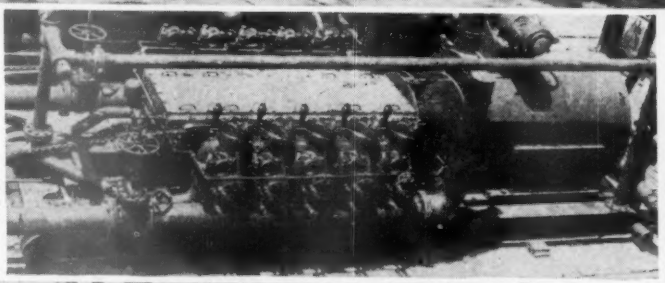
3—Electrical control house where there is sufficient room for men to make repairs and adjustments

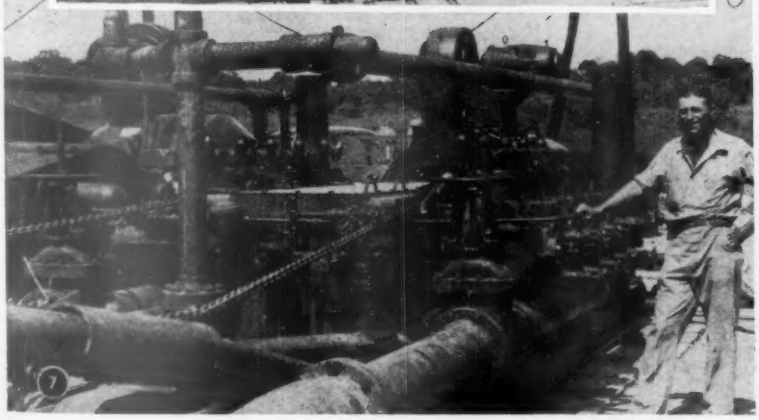
Postwar Rig Layout

Assembled specifically for deep drilling in areas where gas and water are not readily available, figures indicate this rig can be used as economically as other types even where water and gas are plentiful.







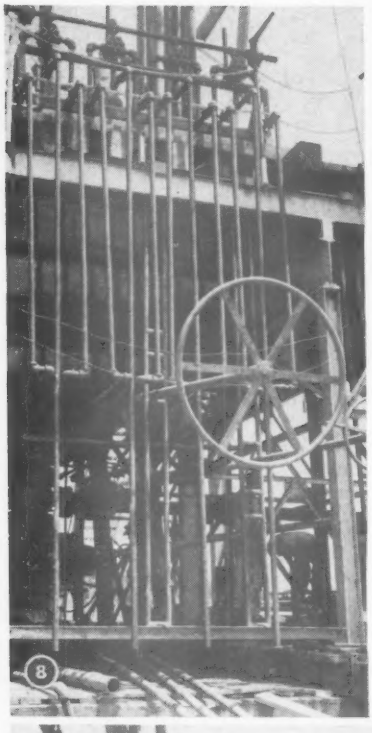


4—Generator end of power units. At right is 300-kw. direct-connected generator and 135-kw. belt-driven generator

5—Electric controls behind driller E. J. Brown provide complete control of generator equipment

6—Air-cooled 300-hp. motor direct connected to rotary. Motor and rotary mounted on Rowan-designed skid. Unit is set low, and may be picked up in one piece

7—New Cooper-Bessemer "Twin-Line" high-pressure, 10-cylinder slush pump. Man is J. M. Shimer, of Cooper-Bessemer, designer of pump. Inset: Looking down on pump



Power is furnished by three 675-hp. Cooper-Bessemer F. W. 8 diesel engines. These diesel engines, which are radiator cooled, are supercharged with exhaust turbo chargers of the Buchi type. Each cylinder delivers 84 hp. at 900 rpm. Two engines are direct connected to Westinghouse 400-kw. variable-voltage direct-current generators. The third engine is direct connected to a 300-kw. generator of the same type, and also belted to a 135-kw. variable-voltage direct-current generator.

The Emsco ECA draw works is driven by an 800-hp. motor which has a permissible intermittent overload rating of 1,200 hp. One mud pump is direct connected to a 600-hp. motor and each of the other two slush pumps is belt driven by a 400-hp. motor. The pump used for mixing mud and jetting pits is belt driven by a 250-hp. motor.

The completely unitized engine and generator equipment is a recent development. Radiator equipped, the only connections when rigging up are fuel and electrical.

One of the most important features of this rig is the simplification of wiring and floor control of generators. All switch and control equipment is oil immersed. The switchboard is designed to take care of heavy cables without complicated rigging, and cables are brought into the end rather than underneath.

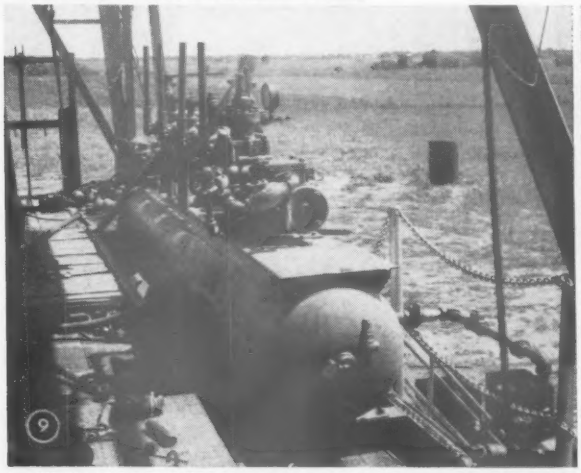
8—Control unit and piping arrangement to three blowout preventers and fluid-operated valve below derrick floor. At upper left is air-operated fluid pump mounted on air tank

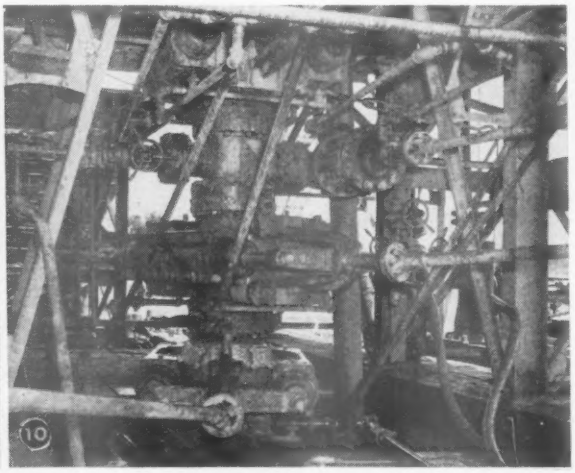
9—Closeup of pressure operating system for control of preventer equipment. In foreground is small air-operated pump mounted on air-storage tank. Beginning at end of air tank is water storage tank and valve manifold to preventers

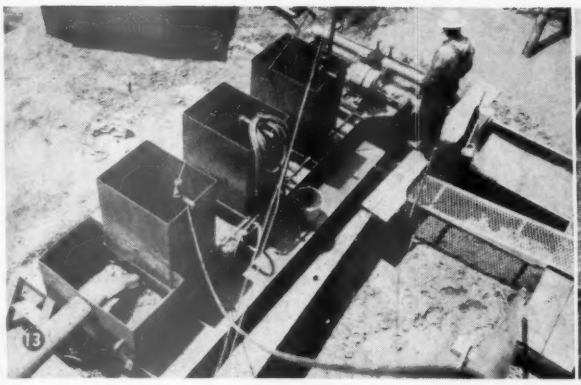
10—Closeup showing arrangement of three QRC Cameron blowout preventers

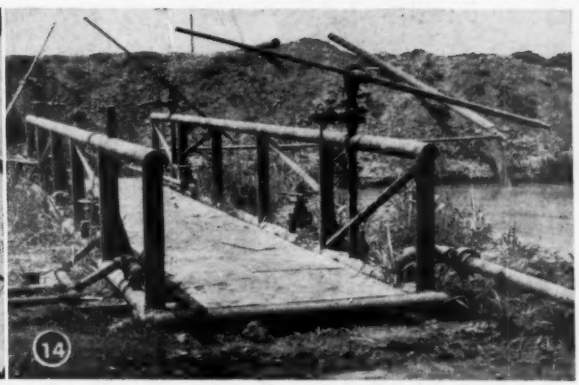
11—Clothes room and tool room built by Mason Brothers to Rowan specifications. Built into engine substructure, time is saved in rigging up and tearing down

12—Radiator end of diesel engines shows individual skids and knock-down portable engine house. Roof telescopes to make complete all-weather cover









The older types of electrical controls employed the use of multiple wheels for the paralleling of generators and it was necessary for the driller to manipulate three or four wheels during hoisting operations. With the electrical setup on this rig the driller can control three generators in parallel with one hand. Without having to call back instructions to the power engineer, the driller has at his fingertips the flexibility of control which permits him, for example, to put up to 150 hp. on the rotary and the remainder of the power on the three pumps; or if rotation is hard, he can put up to 300 hp. on the rotary and still have enough power on the pumps.

Making its first run on this well is the new Cooper-Bessemer multicylinder "Twin-Line" high-pressure reciprocating slush pump. Revolutionary in design and construction, the pump differs greatly from the conventional duplex and triplex types. Its multicylinders, high speed and outside packed plungers result in phenomenal weight and space saving, smooth discharge flow, and high efficiency.

The pump (Type 43) on this rig has 10 cylinders although the same type pump also is being made with 6 and 14 cylinders. It has 4-in. diameter plungers having 3-in. stroke.

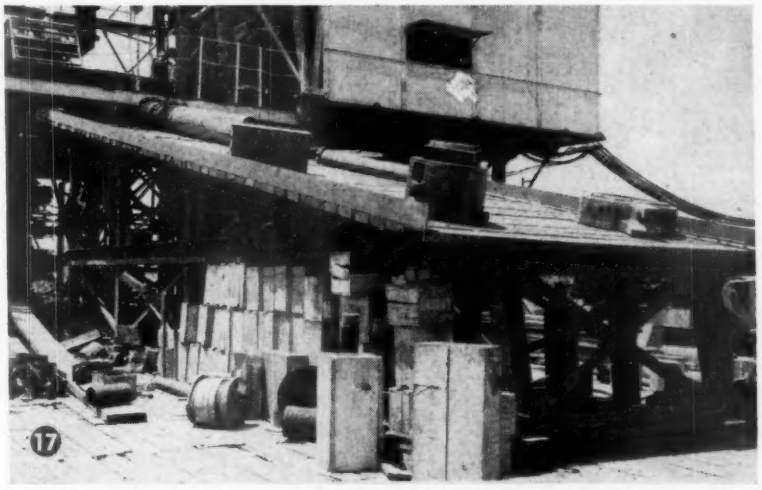
13—Shale shaker and chemical tanks and mud trough built by Wilcon Welding Co. This is all one unit. Each chemical tank holds 2 bbl. Arrangement in trough permits bypassing of screen when making a trip

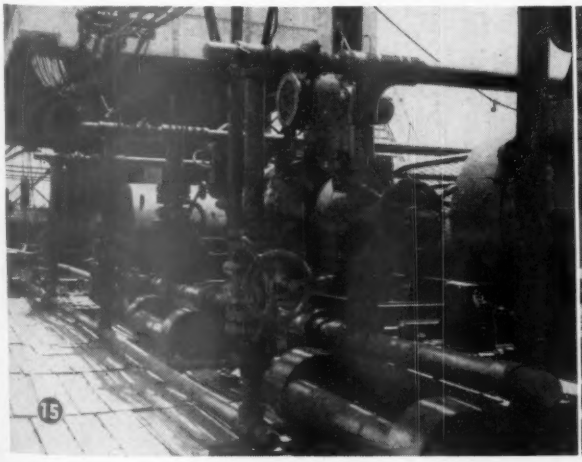
14—Jet gun manifold designed by Rowan consists of four jets and four mud guns. Skid serves as rack for connections, water lines, etc., when moving

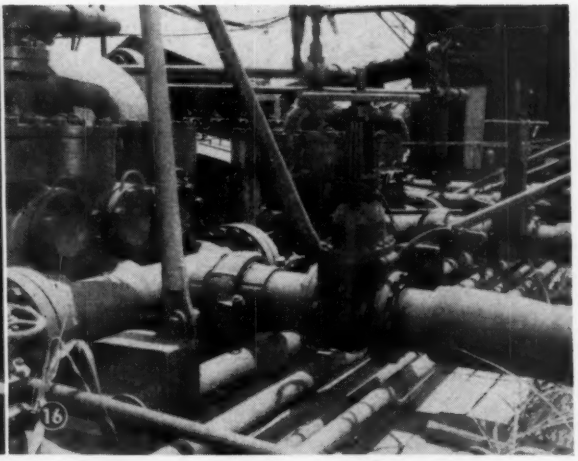
15—Slush pumps are connected and unitized so that one can be quickly pulled out and another put in

16—Mud end equipped with Thornhill-Craver flange facilitates quick mud-pump replacement

17—Upper portion of three-piece ramp built by Nowery J. Smith to Rowan specifications. Facilitates rigging up and tearing down, since truck can back right up to derrick floor







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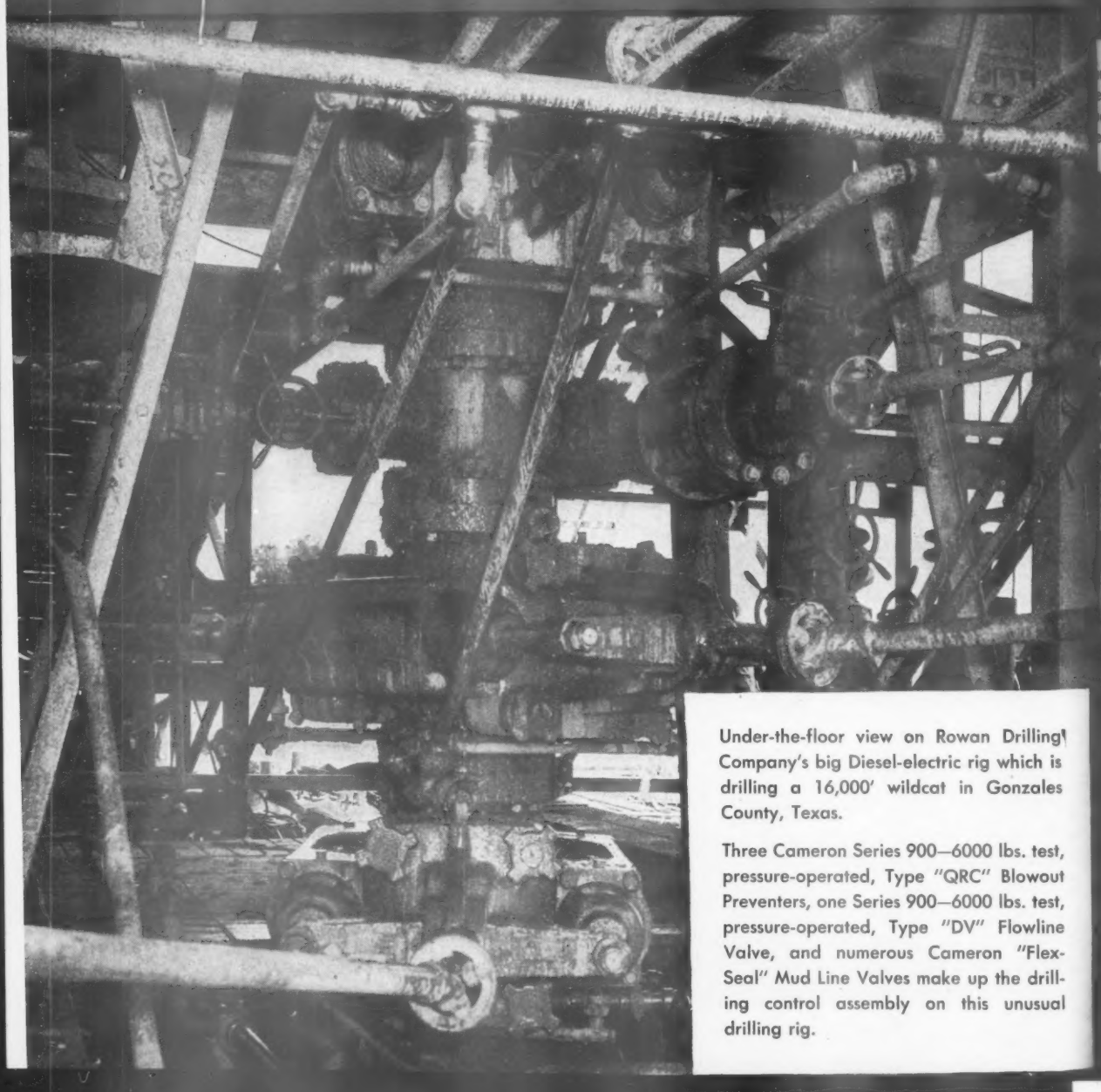
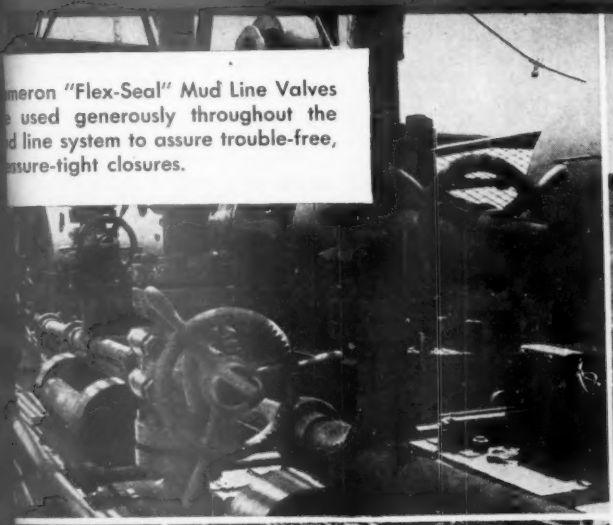


Under-the-floor view on Rowan Drilling Company's big Diesel-electric rig which is drilling a 16,000' wildcat in Gonzales County, Texas.

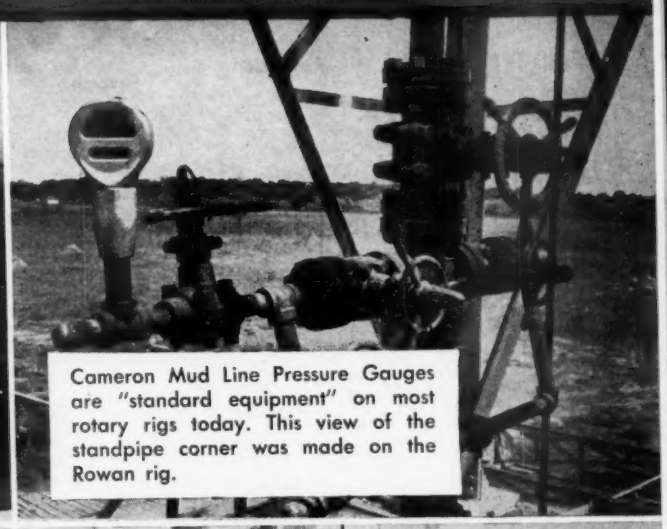
Three Cameron Series 900—6000 lbs. test, pressure-operated, Type "QRC" Blowout Preventers, one Series 900—6000 lbs. test, pressure-operated, Type "DV" Flowline Valve, and numerous Cameron "Flex-Seal" Mud Line Valves make up the drilling control assembly on this unusual drilling rig.

CAMERON-IZED

Rowan Drilling Company's Up-To-The-Minute Diesel Electric Rig Makes Extensive Use of Cameron Equipment

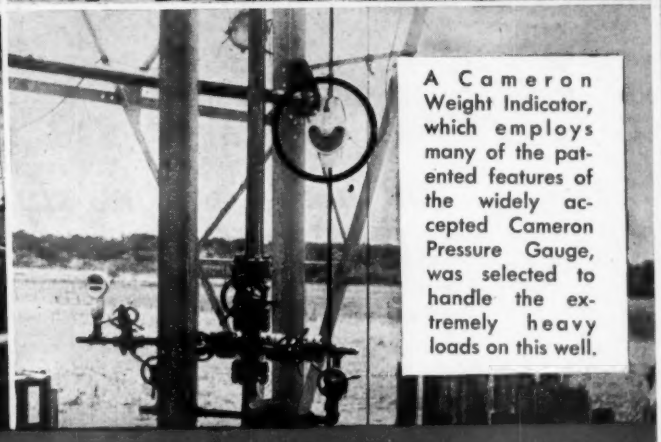


meron "Flex-Seal" Mud Line Valves used generously throughout the d line system to assure trouble-free, ssure-tight closures.



Cameron Mud Line Pressure Gauges are "standard equipment" on most rotary rigs today. This view of the standpipe corner was made on the Rowan rig.

Here is a fortune in power mud pumps, including a new multi-cylinder pump on field test, being safeguarded by Cameron positive acting Shear-Relief Valves.



A Cameron Weight Indicator, which employs many of the patented features of the widely accepted Cameron Pressure Gauge, was selected to handle the extremely heavy loads on this well.

CAMERON IRON WORKS, INC.

711 MILBY ST., HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y. California: Howard Supply Co., Los Angeles. Oklahoma: 310 Thompson Bldg., Tulsa.

XUM

Top recommended continuous speed is 400 r.p.m., permitting the use of direct-connected prime movers and eliminating gear or V-belt drives. The pump may be operated at a speed of 500 r.p.m. It is being driven by a 600-hp., 395-volt d.c. motor under variable voltage control.

Basic construction of the pump consists of a central crankshaft in an enclosed box to which the pump cylinders are attached on opposite sides of the crankshaft. One connecting rod serves to operate two plungers, one of which on one side of the crankshaft is taking suction while the other on the other side is discharging. Plungers are single acting. Consequently, the 10-cylinder pump has a five throw, the 6-cylinder pump a three throw, and the 14-cylinder pump a seven throw crankshaft.

Cylinders are made of cast Meehanite and are designed for continuous operation at 2,000 psi. discharge pressure. A large factor of safety above this is provided, however, as was evidenced by the fact that in a factory test a standard cylinder withstood a hydrostatic pressure of 12,500 psi. without bursting. Higher pressures could not be held by the gaskets.

The 10-cylinder unit now in use weighs 18,000 lb. Tested with both clear water and normal rotary mud at a minimum of 400 r.p.m. against 2,000 psi. discharge pressure, it showed a volumetric efficiency of 80 per cent. At 500 r.p.m. it has a displacement of 820 g.p.m. Because of the twin construction, either side may be operated alone, providing half the capacity at twice the discharge pressure at any speed within the speed range.

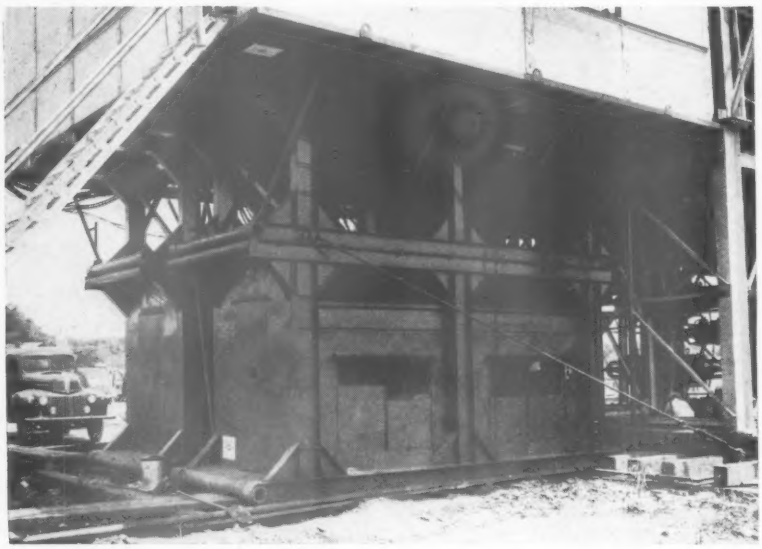
In effect, the design provides two separate and independent pumps tied together 180° apart. With separate suction and discharge connections to each side, it is possible to pump to two kinds of liquid at one time against different discharge pressures. These types of operation in no way change the discharge flow characteristics or cause undesirable pulsations. The percentage of pressure fluctuations above and below the mean is the same for one set of cylinders on one side as it is for both sets. The connecting-rod length to crank radius is 12:1 which further smooths out the flow and reduces the connecting-rod thrust against the crosshead guides.

Independent of Mud Pumps

A highly efficient system for controlling preventer equipment is utilized on this rig. Fig. 11 shows the three Cameron blowout preventers. These preventers and also a fluid-operated valve installed below, are operated by means of a pressure system independent of the mud pumps. When conditions necessitate it, the upper preventer and hand operated valve may be closed and the well handled through choke lines. Under these conditions, the drill pipe can be rotated through the upper preventer and the well controlled through the flow lines. If the top rams become worn it is possible to go on the bottom rams and change the rams on the top preventer. The middle preventer has blind rams and may be used as a master valve.

Fig. 9 shows the system for operating the rams and fluid operated valve. This system is considerably more positive than the usual mud pump control. Referring to Fig. 10 it will be noted that the independent pressure system consists of a small water pump mounted on a tank. The pump is air operated and the tank upon which it is mounted has sufficient air reserve to close and open each preventer three times. Air is supplied from an air compressor located in the auxiliary house adjacent to the diesel-electric power units. The water-storage tank (shown in Fig. 10 at end of air storage tank) likewise, has sufficient fluid capacity to open and close each preventer three times. Both water and air storage tanks are kept filled automatically. The pump holds about 250 psi. water pressure on the system, and by means of a small high-pressure hand pump, the pressure may be built up to 3,000 psi. with a few strokes.

Mason Bros. Substructure with built-in Utility Houses . . . . . .



. . . ON ROWAN DRILLING COMPANY'S GIANT DIESEL-ELECTRIC RIG

Among the new efficiency features incorporated in this ultra-modern rig are the all-steel houses built into the substructure. This entire unit was designed and constructed for Rowan Drilling Company by Mason Brothers Construction Company.

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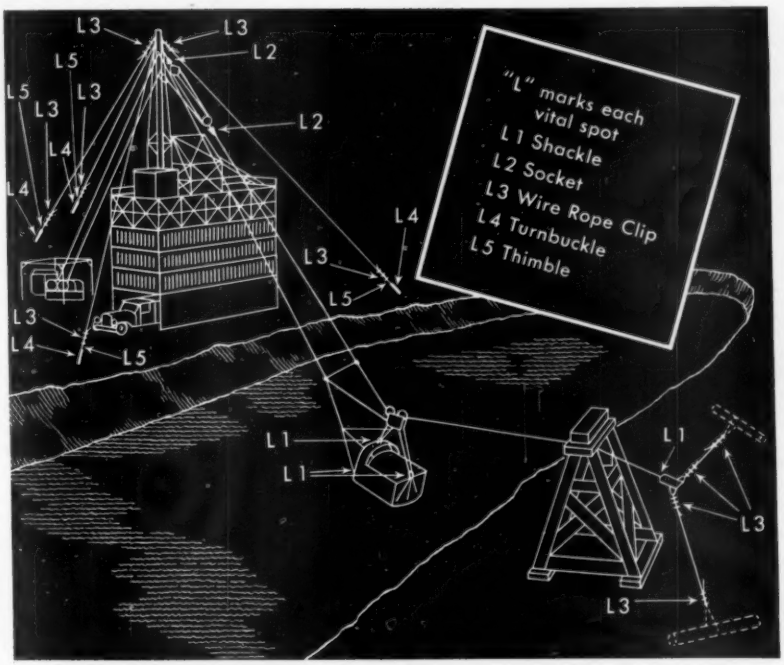

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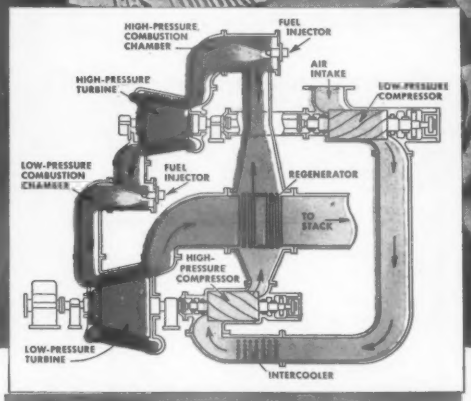

Schematic drawing showing heat cycle and operating principle of the Elliott Gas Turbine.

IT'S HERE, NOW — this new prime mover that engineers everywhere and large builders of heavy equipment have sought to develop. It turns fuel into power directly, without steam equipment or reciprocating engine design. Elliott Company after years of research and experimentation, marked by characteristically ingenious engineering skill, has built and operated the first successful gas turbine for ship propulsion. The Elliott gas turbine plant is in production.

Further developments to be expected. But the *tough job is done*—there remains the task of applying this new Elliott prime mover to the various needs of industry and transportation. Some of these applications in their probable forms, are illustrated below.

The Elliott Gas Turbine is not a dream of future low cost and limitless power . . . It is a thoroughly practical development, utilizing thermodynamic and physical laws with which every engineer is familiar. The gas turbine is here, now — Elliott Company's latest and one of its many important contributions to the power industry.

For further information ask for the "Gas Turbine Issue" of Powerfax.

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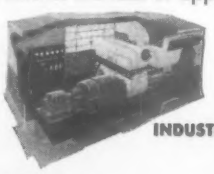
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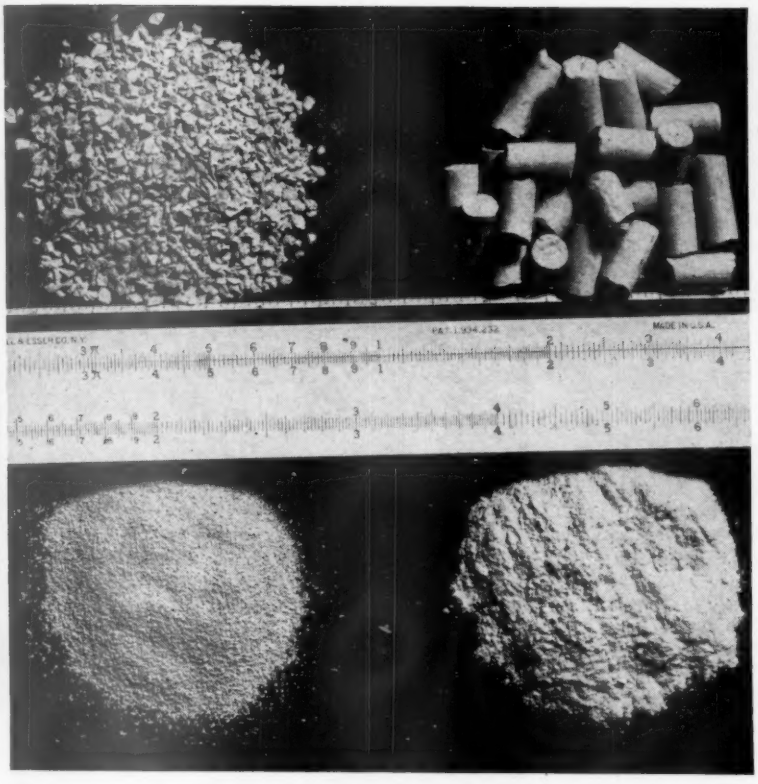
T-11

Hydrogenation-Dehydrogenation, Aromatization Catalysts Important to Refining Technology

by Arch L. Foster

PART 4 OF A SERIES

A large number of materials have been recommended as catalysts for hydrogenation and dehydrogenation reactions. Most of these are metallic oxides and salts from Periodic Table Groups 3, 4, 6, and 7. Chromic oxide is one of the catalysts most widely used; also vanadium, aluminum, and nickel oxides as well as metallic nickel. A combination of products is used such as vanadium oxide, alumina and KOH, $CaCl_2$, or Na_2CO_3. Metallic alloys are used as dehydrogenation agents. Active metals or oxides are supported in very thin layers on a relatively inactive base.

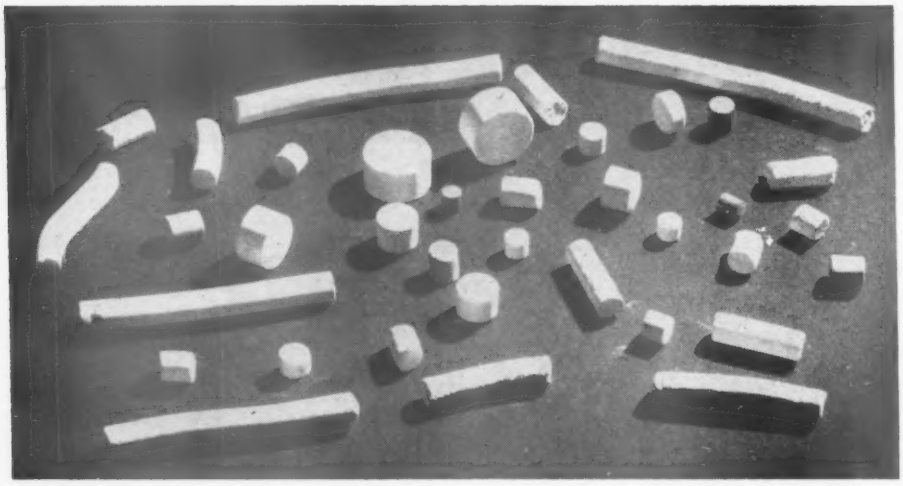


Extruded rods, and three mesh sizes of granular catalyst, of fuller's earth. (Courtesy The Floridin Co.)

WHILE hydrogenation and dehydrogenation catalysts range widely as to composition, the large percentage of them are formed from one or more of the oxides, and/or sulfides of the middle-molecular-weight metals and metallic elements in Periodic Table Groups 3, 4, 6, and 7. These oxides and sulfides appear to possess in large degree the property of forming dense though highly porous solids, especially under certain conditions of preparation and activation. Catalytic activity is dependent on, among other properties, a greatly extended catalyst surface and thus porous solids such as fuller's earth, activated bentonite, montmorillonite, bauxite, and similar products show a remarkable development of this one prerequisite.

Another characteristic of hydrogenation and dehydrogenation reactions is the necessity for high temperatures and pressures, generally speaking. Olefinic hydrocarbons are much more reactive than are paraffins, and are excellent raw materials or intermediates for chemical syntheses of all types of organic compounds. A major deterrent, however, is the combination of severe operating conditions and therefore of high cost for production of olefins direct from paraffinic stocks. In a majority of cases olefins employed on large commercial scale for synthetic products have been produced either by the destructive thermal cracking of gaseous or liquid hydrocarbons of low initial cost, or have been obtained as byproducts of thermal cracking for motor-fuel production. For the preparation of butadiene from either butane, butenes, or other base materials catalysts were used on a large scale during the war period.

Chromium oxide catalysts are employed widely for catalytic dehydrogenation. In one instance (5-246) Cr_2O_3 prepared in a very specific manner showed its highest activity for hydrogen removal at 500°-600° C (932°-1,112° F.) holding its initial activity for from 1 to 3 hours. Cooling this catalyst in an atmosphere of nitrogen gas reduced greatly its activity. The catalyst is regenerated by passing air over it for ½ hour at the temperature employed for the dehydrogenation reaction. This method showed 85.8 per cent, of the butane which reacted, converted to butenes. Ethylcyclopentane is dehydrogenated by a vanadium catalyst, the reactions including aromatization, olefin formation, and decomposition to carbon and hydrogen, these products being formed in the ratio of 2:2:1. The activation energy required is 31,500 calories per mol for fresh catalyst, and 34,900 calories per mol for regenerated catalyst (5-247). Burk and Hughes (5-249) prepare a catalyst for dehydrogenation of hydrocarbons by dissolving manganese acetate or other organic salt of manganese in water, mix in alumina in suspension and precipitate manganese oxide, first with ammonia gas, then with ammonium hydroxide. The two precipitates, alumina and Mn oxide, are settled out together and so combined to form the catalyst. A mixture of one part of "bluish, chalky, hydrous chromium oxide" with one-fourth part of a monobasic acid the chromium salt of which is water-soluble and which salt hydrolyzes to give free acid and which continues until all the hy-



Left: Different shapes of preformed Diamond-Harshaw catalysts such as may be used in refining and other processes

Below: Fuller's earth decolorizing, clarifying, and purifying catalyst, as in Gray treating process. (Courtesy Attapulgus Clay Co.)

drous chromic oxide is dissolved. From this thick (5-250) solution the green $Cr(OH)_3$ is precipitated with "alkali," and dehydrated. An "unglowed" metal chromate catalyst for dehydrogenation purposes may be made by heating (5-252) the complex salt $(NH_4)_2M(CrO_4)_2\text{-}2NH_3$ (where M is copper or cadmium) under carefully controlled conditions below the point of incandescent temperature but high enough to decompose the salt and form the catalyst.

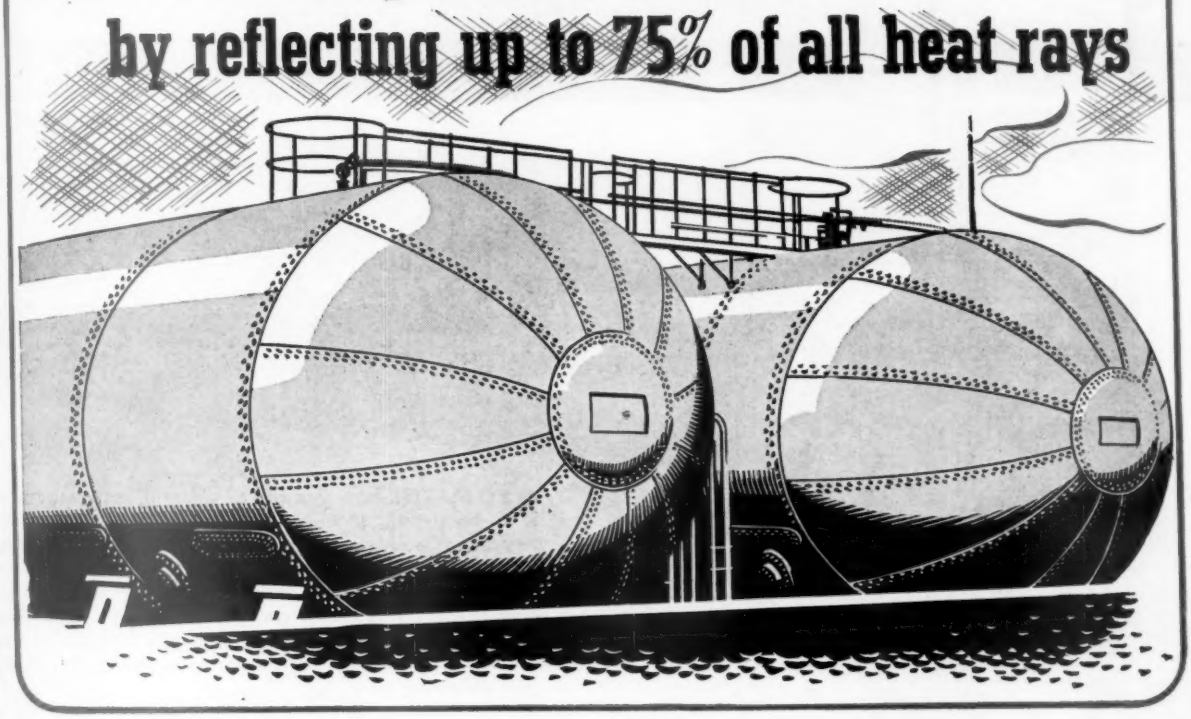
Similarly through its ammonium salt a molybdenum catalyst may be made from ammonium molybdate mixed with a paste of $Al(OH)_3$ and acetic acid to precipitate molybdic hydroxide (acid), drying and pelletizing the mixture of precipitates (5-253) and heating to 1,200° F. Dehydrogenation and reforming of a naphtha, for example, may be carried out by using a plurality of dehydrogenation catalysts, with a promoter used at the lower temperatures (5-254). Charge vapors are passed first at high temperature into the most active catalyst, passing in succession to a series of zones in which the endothermic heat of reaction lowers the temperature and where the percentage of promoter increases as the temperature decreases from zone to zone. A supported catalyst is made by soaking a carrier material in a solution such as one of $Al(NO_3)_3$ and heating the carrier to 1,050-1,200° F. to decompose the nitrate and coat the carrier with a film of Al_2O_3 (5-255a).

A catalyst suitable for dehydrogenating a paraffin such as heptane to toluene (5-256) is formed by heating chromic sulfate in a reducing atmosphere to form a mixture of chromic oxide and chromic sulfide which becomes the catalyst. Reduction of the carbon-forming tendency of a catalyst, that is, its tendency to dehydrogenate the hydrocarbon completely, is claimed by adding to a mixed catalyst of chromia and alumina a small amount of an alkaline earth metal oxide, such as CaO or MgO, and carrying out the dehydrogenation reaction at 450° - 750° C. (842° - 1,382° F.) (5-257). Dehydrogenation catalysts which are effective are prepared (5-258) by precipitating the gel-type Cr_2O_3 and drying in an oxidizing atmosphere below 200° C. (392° F.) to give an "oxidizing capacity" up to 40 per cent hexavalent chromium; disruption of the gel-type structure must be avoided in treating this material to make the finished catalyst.

Supported dehydrogenation catalysts includes oxides of vanadium, columbium, or tantalum, deposited on alumina (5-259). This catalyst is effective when used at 500°-700° C. (932°-1,292° F.), with less than 1 second exposure of the charge to the catalyst, and at one-fourth atmosphere (3.75 psia.) pressure. In the same guise a hydrogenation catalyst is made by depositing finely divided copper on a carrier such as asbestos. Another dehydrogenation catalyst is composed of alumina mixed with oxides of iron, nickel, or cobalt, and with relatively small amounts of hydrogen sulfide mixed with the hydrocarbon vapors treated (5-260). Magnesium oxide, zinc sulfate, and lead chromate are used to dehydrogenate and desulfurize hydrocarbons (5-261) by first forming olefins and hydrogen, then hydrogenating the olefins and sulfur present to form paraffins again, and H_2S, at 750°-1,000° F. and 750-5,000 psi.

A combination of catalysts for conditioning motor fuel is claimed of which the first step is dehydrogenation by means of zinc oxide at 825°-1,025° F., followed by polymerization with alumina, tungstic oxide, WO_3, or bauxite, to stabilize the olefinized product against gum formation (5-262). An analogous dehydrogenating catalyst is made (5-263) by soaking alumina in a solution of KOH, Na_2CO_3 or $CaCl_2$, heating to dry the impregnated alumina which contains 0.5 to 6 per cent of the alkalizing material. Still another catalyst of this type is made (5-264) by supporting an oxide of vanadium, chromium, or molybdenum on alu-

Reduces Evaporation Losses by reflecting up to 75% of all heat rays

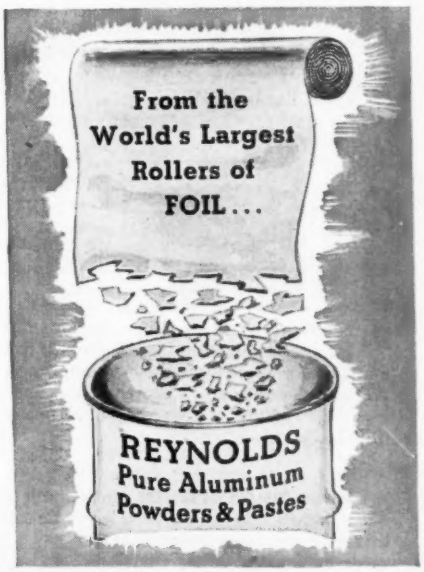


It's more than paint . . .
It's LIQUID ALUMINUM

EVAPORATION losses up to 200 barrels per tank per year are reduced as much as 35 to 50% through the use of aluminum coatings. When applied to storage tanks, tiny flakes of pure metallic aluminum form an overlapping shield that reflects up to 75 per cent of all heat rays.

Be sure to insist on aluminum coatings of standard quality made with Reynolds Aluminum Powders and Pastes, free from corrosion-forming impurities. These superior pigments are made from purest Reynolds aluminum foil stock . . . rolled . . . flaked . . . polished to top brilliance and reflectivity . . . quality-controlled every step of the way from mine to pigment and backed by a quarter-century's experience.

Write for complete information. Reynolds technicians will gladly work with you. Reynolds Metals Company, Pigment Division, 19 East 47th Street, New York 17, New York.



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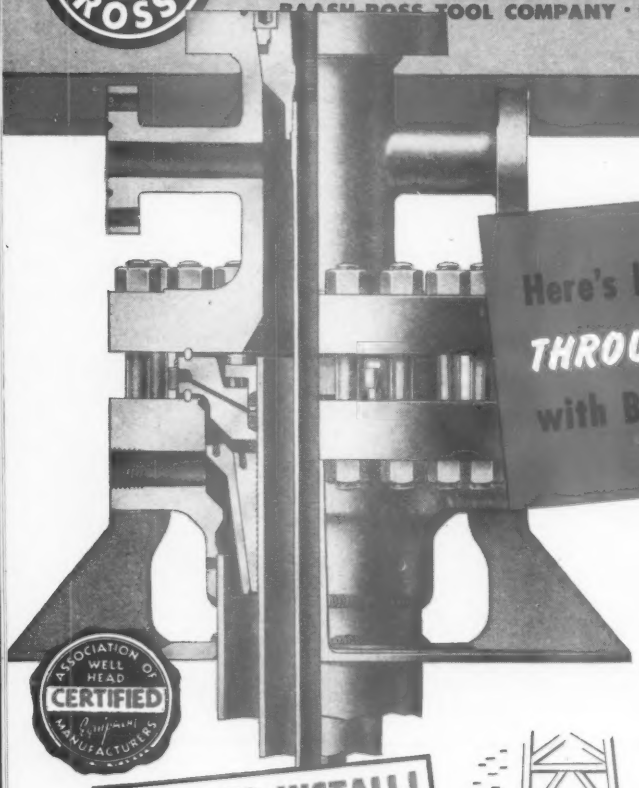
REYNOLDS METALS

REYNOLDS *points the way through* **ALUMINUM POWDERS and PASTES**

Baash-Ross News

BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

OUR 25 YEAR

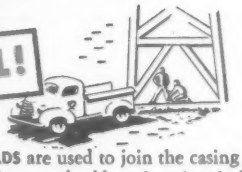


Here's how you get positive pressure control THROUGHOUT THE LIFE OF THE WELL with Baash-Ross Casing and Landing Heads!

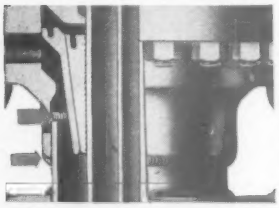
ASSOCIATION OF WELL HEAD EQUIPMENT MANUFACTURERS CERTIFIED

NO MATTER how you are now handling your casing programs, it will pay you to study carefully the important advancements engineered into Baash-Ross Casing and Landing Heads. For *throughout the life of the well*—from the day the head is first installed to the day the well is completely abandoned—Baash-Ross Heads enable you to maintain positive pressure control on *all* casing strings with maximum simplicity, safety and efficiency . . .

SAFER TO INSTALL!

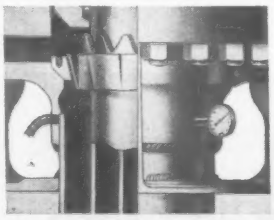


1. TWO FULL-CIRCUMFERENTIAL WELDS are used to join the casing to the landing head. This not only forms a *double* seal against leaks, but also provides a channel by which both welds can be quickly and simultaneously checked for pressure-tightness (as outlined below) *before they are put in service.* And this double-weld feature has the added advantage of giving *double* support to the casing string.



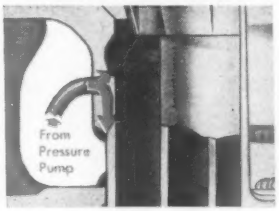
2. STRONGER WELDS are also assured by another Baash-Ross design feature. Note that the support flange is specially engineered with a wall section approximately equal to that of the casing. This insures uniform heat distribution between casing and flange when welding, resulting in a better, stronger weld than is possible with conventional thick-bodied heads.

3. IMMEDIATE PRESSURE TEST can be made on the welds through threaded ports that are provided in the landing head body. Note that these ports connect directly to the annular space between the two welds. By simply attaching a gauge to one port and a pressure pump to the other, both welds can be simultaneously and instantly checked for pressure tightness. If a leak should be discovered, it can be quickly repaired while the welding equipment is still on the rig. This safeguards against leaks showing up after the head is in service!

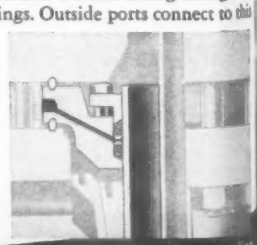


SAFER TO MAINTAIN!

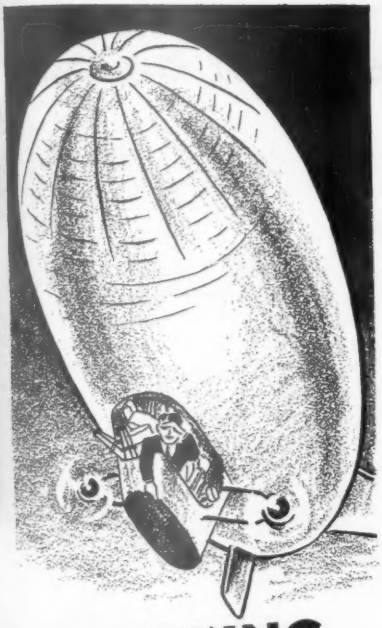
4. QUICK PACK-OFF of any leaks that might develop over the years that the head is in service is provided by another unique feature. At any time during the life of the well the welds can be quickly re-tested for pack-off. If leaks are discovered there's no need to dismantle the head . . . kill the well . . . or even break connections. Simply pump plastic packing in through the threaded ports, thus filling the annular space between the welds and sealing off *all* leaks, small or large.



5. SUCCEEDING STRINGS also have the same lifetime control features. Note how packing element for succeeding strings has an annular space between packing rings. Outside ports connect to this channel so that the pressure seal can be quickly tested after installation. Moreover, *at any time during the life of the well* any string can be individually re-tested and leaks plastic-packed. There's no need to disturb the well or even break connections. It's far safer, too, because no re-welding is necessary. Welding is always dangerous around a well on production!



GET the complete facts on these important advancements in Landing and Casing Head design . . . on how you can obtain positive pressure control of each string in your casing program throughout the life of the well. Baash-Ross Casing and Landing Heads are available in both welded and slip suspension types for use with all standard API flanged tubing heads and spools. Write direct for recommendations to fit your particular casing program. Also, more details are on page 266 of your Composite Catalog!



LOOKING FOR A PLACE TO LAND?

Here's a spot where a cordial welcome awaits you. A clean, aggressive city, friendly to industry, conducive to profitable relationships, especially sympathetic to the oil man's problems—is ideally situated to serve you.

Consider WICHITA

Send FOR BOOKLET OUTLINING ADVANTAGES

THE CHAMBER OF COMMERCE OF WICHITA, KANSAS

mina. This catalyst aids in transferring hydrogen from a hydrocarbon of more than two carbon atoms to a lower olefin such as ethylene, as a "hydrogen acceptor," then polymerizing the resulting higher olefin, such as butene, etc.

Liedholm (5-265) dehydrogenates hydrocarbons in the presence of a metal or alloy such as a reaction chamber of KA2S alloy with the aid of a catalyst such as chromium oxide at 750° or higher, regenerating the catalyst by burning off carbon deposited thereon. A two-step method for making higher-octane-number gasoline (5-266) is by the use of an oxide of Mo, Cr, W, U, or V on alumina at 875°-1,025° F. and 30-450 psi., then mixing the hydrogen so formed by aromatizing the charge, with more charge in the ratio of 5-50 mols of hydrogen per mol of charge, at up to 3,000 psi.

Many other catalyst combinations have been offered to promote dehydrogenation. Cerium oxide is added to the familiar alumina-chromia catalyst, as an activator (5-267). Chromia-alumina and similar catalysts are placed in a reaction zone with large particles at the top or entrance zone, grading to fine particles at the bottom (5-268). One per cent or more of beryllium oxide is used with alumina-chromia or alumina-MoO_3 catalyst as an activator or promoter (5-269). Even an $AlCl_3$-isobutene complex is credited with converting alkyl phenols to olefins (5-272). Green, gelatinous chromic hydroxide is precipitated from solution upon granular support such as bauxite (5-284) with ammonium hydroxide, washed and dried as a catalyst for dehydrogenation purposes. Still other materials are recommended especially as catalyst promoters; however, the list mentioned above covers the main types of catalysts used or proposed for dehydrogenation purposes.

Hydrogenation Catalysts

Pure metallic nickel, in a finely divided state, is our most widely used hydrogenation catalyst, especially for hydrogenation of vegetable or animal oils to produce edible fats. The famous Sabatier and Senderens discovery of hydrogenation of cotton oil to form cooking fats has rather revolutionized that phase of food supply. Metallic nickel is used to reduce hydrocarbons, such as benzene, to cyclohexane (5-248). Small amounts of cobalt, iron, or copper do not affect the activity of nickel and all mixtures reach maximum activity at about 220° C. (428° F.). Coal is hydrogenated efficiently (5-245) with a tin-iron alloy made by reducing tin compounds on iron, after which most or all of the iron is removed with sulfuric acid, which increases the activity. A

(Continued on page 131)

TO SHUT IN Gas Wells with EXTREME PRESSURES

USE

ROBINSON HIGH PRESSURE THREE-IN-ONE PACKERS

One of the outstanding qualities of this famous Robinson product is the unusually large expansion obtained by using double or triple lengths of rubber, the lower one telescoping the one above.

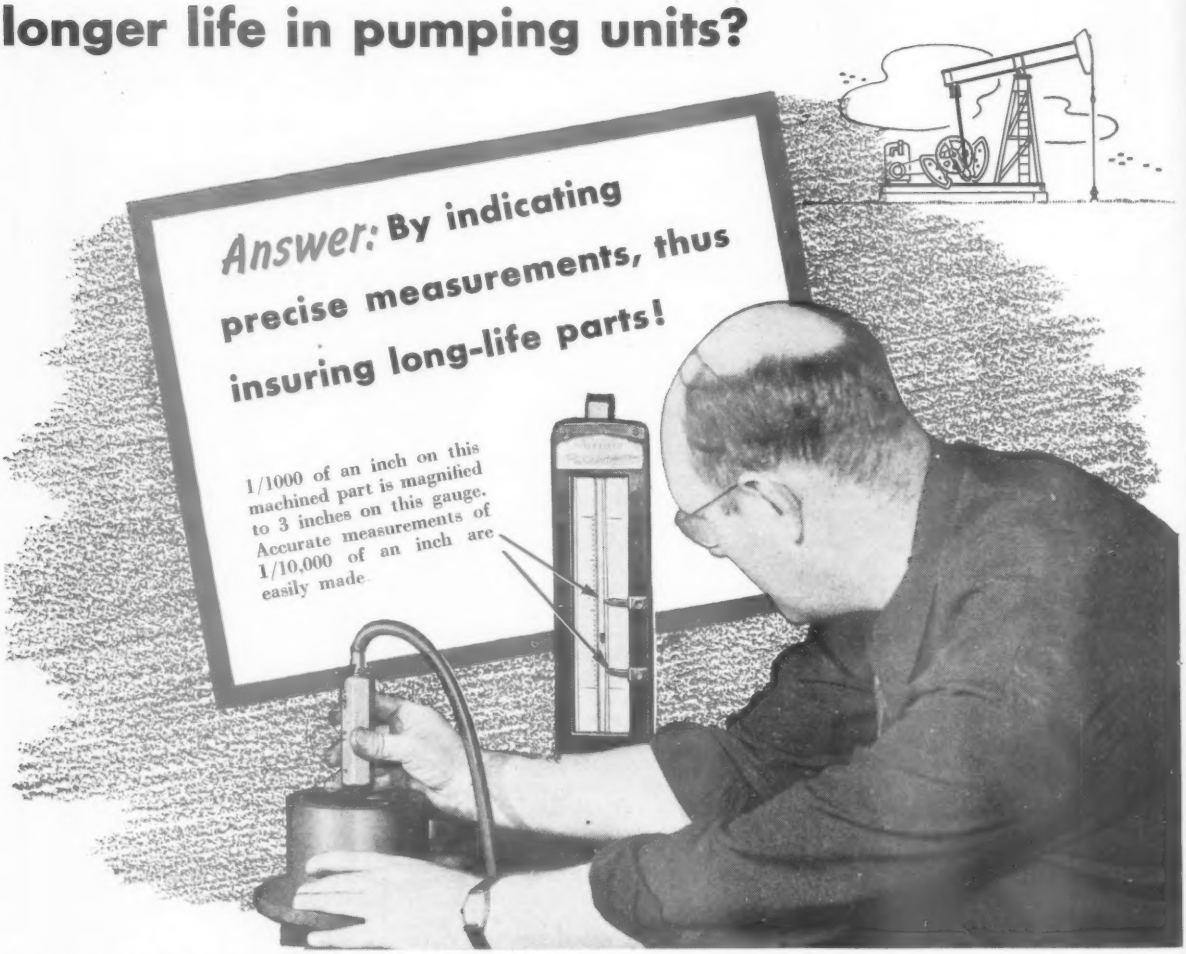
In addition, the perforations above the rubber permit this packer to be run in against enormous gas pressures, tending to equalize the pressure above and below the rubber.

Other trouble-saving features of the Robinson High Pressure Three-In-One Packer:

- **May be set any distance from bottom of the well.**
- **Mud or fluid may be used on top of the packer to assist in holding high gas pressures.**
- **Weight of tubing or casing sets packer when bottom of hole is reached.**

P. O. Box 1408
TULSA, OKLAHOMA
Factory: Coffeyville, Kansas

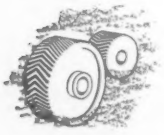
Question: How can a stream of air put longer life in pumping units?


Answer: By indicating precise measurements, thus insuring long-life parts!
1/1000 of an inch on this machined part is magnified to 3 inches on this gauge. Accurate measurements of 1/10,000 of an inch are easily made.

A PUMPING UNIT IS ONLY AS GOOD AS ITS PARTS. THESE IDECO UNIT PARTS MEAN LONG LIFE AND LOW MAINTENANCE:

SHAFTS GROUND to tolerances of 1/1000 of an inch

GEAR BOX PARTS MACHINED to tolerances of 1/1000 of an inch



GEARS LAPPED to backlash tolerances of 3/1000 of an inch on smaller gears —7/1000 of an inch on larger gears

STRUCTURES WELDED in jig frames for accuracy of alignment

* * *

Precision-made spare parts for IDECO Pumpers are always available.

Pictured above is a Precisionaire Gauge that measures with a stream of air the accuracy of machined surfaces on Ideco Pumper parts. Used by Uncle Sam for accurate measurements on war production, it is now used by Ideco—one of the first manufacturers to employ such precision gauges for commercial work.

This super-sensitive instrument helps to add extra years of maintenance-free life to Ideco Pumping Units, because it assures all parts having the proper fit.

Before you buy your next pumper, check for manufacturing accuracy . . . investigate the long-life, low-maintenance Ideco units at your Ideco Sales Office or Supply Store . . . or the associated Ideco Distributors: American Pipe and Supply Co.; Bovaird Supply Co.; Howard Supply Co.; Mid-Continent Supply Co.; Republic Supply Co.

IDECO

ONE OF THE DRESSER INDUSTRIES

INTERNATIONAL DERRICK & EQUIPMENT CO.

Regional Sales Offices: Columbus 8, Ohio; Dallas 1, Texas; Los Angeles 13, Calif. **Export:** 122 East 42nd Street, New York 17, New York . . . **Sales Offices, Stores and Distributors** in all active oil fields.

N.G.A.A. Standard Table Of Physical Constants for Paraffin Hydrocarbons

The table of physical constants presented here represents an effort to provide the natural-gasoline industry with authoritative numerical values for the physical properties of the hydrocarbons commonly occurring in the natural-gasoline range. Data on the intermediate paraffins and other types of hydrocarbons were omitted intentionally to make this table a more convenient tool and simple standard reference for analytical and engineering computations in the natural-gasoline industry.

CONSTANTS USED IN CALCULATIONS

Atomic Weights: Carbon—12.01; Hydrogen—1.008; (Handbook of Chem. & Phys., Hodgman).
1 gal. = 3,785.33 ml.
1 cu. ft. = 28.316 l.
1 lb. = 453.59 g.
1 mol = 379.498 cu. ft. of perfect gas at 14.696 psia. and 60° F.
Perfect gas at 32° F. 14.696 psia. = 22.414 l./g. mol.
760 mm. Hg. = 14.696 psia.
0° F. = 459.58° Rankine.
Density of water at 60° F. = 8.327 lb./gal. = 0.999015 g./cc.
Sp. gr. at 60/60° F. × 0.999015 = density at 60° F. in g./cc.
Molecular weight of air = 28.966. 1 cu. ft. = 7.480 gal.

EXAMPLES OF CALCULATIONS

DENSITY CONSTANTS OF LIQUID (Example N-Octane)

Correcting Sp. Gr. to 60/60° F.

Sp. Gr. of N-Octane at 20/4° C. = 0.70283
(Approximate A.P.I. = 69)

From U. S. National Bureau of Standard Circular C-410, the volume correction factor for 69° A.P.I. gasoline converting from 20° C. (68° F.) to 60° F. is 0.9946.

$$\frac{0.70283}{0.9946} = 0.7066 \text{ Sp. Gr. at } 60° \text{ F. compared to water at } 4° \text{ C.}$$

Density of water at 60° F. referred to water at 4° C. = 0.9990421

$$\frac{0.7066}{0.9990421} = 0.7073 \text{ Sp. Gr. } 60/60° \text{ F.}$$

$$\text{A.P.I.} = \frac{141.5}{\text{Sp. Gr. } 60/60° \text{ F.}} - 131.5 = \frac{141.5}{0.7073} - 131.5 = 68.6$$

Lb./Gal. = 8.327 × Sp. Gr. = 8.327 × 0.707 = 5.89

DENSITY CONSTANTS OF VAPOR (Example propane)
(Air = 1.000)

$$\text{Sp. Gr. of vapor} = \frac{\text{Molecular weight of gas}}{\text{Molecular weight of air}} = \frac{44.094}{28.966} = 1.522$$

Lb./M.c.f.

$$= \frac{\text{Molecular weight}}{\text{Cu. Ft. per Lb. Mol}} \times 1{,}000 = \frac{44.094}{379.498} \times 1{,}000 = 116.2$$

Cu. Ft. Vapor/Gal. Liquid

$$= \frac{\text{Sp. Gr. liq. at } 60/60° \text{ F.}}{\text{Molecular weight}} \times \frac{22.414}{28.316} \times \frac{520.58}{491.58} \times 0.999040 \times 3{,}785.33$$

$$= \frac{\text{Sp. Gr. liq. at } 60/60° \text{ F.}}{\text{Molecular weight}} \times 3{,}163.97 = \frac{0.508}{44.094} \times 3{,}163.97 = 36.45$$

Ratio Gas Volume/Liquid Volume:
= 7.480 × cu. ft. vapor per gal. liquid = 7.480 × 36.45 = 272.7

(See Reference Bibliography on next page)

PHYSICAL CONSTANTS OF PARAFFIN HYDROCARBONS—1945

N.G.A.A. Standard 2145

	METHANE	ETHANE	PROPANE	ISO-BUTANE	N-BUTANE	ISO-PENTANE	N-PENTANE	N-HEXANE	N-HEPTANE	N-OCTANE	N-NONANE	N-DECANE
Molecular Formula	CH_4	C_2H_6	C_3H_8	C_4H_{10}	C_4H_{10}	C_5H_{12}	C_5H_{12}	C_6H_{14}	C_7H_{16}	C_8H_{18}	C_9H_{20}	$C_{10}H_{22}$
Molecular Weight	16.042	30.068	44.094	58.120	58.120	72.146	72.146	86.172	100.198	114.224	128.250	142.276
Melting Point @ 14.696 Lbs./sq. in. Abs. °C.	−182.5 23	−183.2 28	−187.7 37	−159.4 55	−138.3 55	−160.6 29	−129.7 29	− 95.4 29	− 90.6 29	− 56.8 7	− 53.7 7	− 29.7 9
°F.	−296.5	−297.8	−305.9	−255.3	−216.9	−257.1	−201.5	−139.7	−131.1	− 70.0	− 64.7	− 21.5
Boiling Point @ 14.696 Lbs./sq. in. Abs. °C.	−161.4 24	− 89.0 38	− 42.1 9, 37	− 11.7 55	− 0.5 16	+ 27.9 55	36.1 6, 15	68.7 15, 8	98.4 15, 17, 35	125.7 7	150.7 7	174.0 9
°F.	−258.5	−128.2	− 43.8	+ 10.9	+ 31.1	+ 82.2	97.0	155.7	209.1	258.1	303.3	345.2
Density of Liquid Specific Gravity @ 60/60° F.	0.3** 19, 20, 21	0.374 44	0.508 41	0.563 41	0.584 23, 5, 41	0.625 12	0.631 14, 15, 41	0.664 8, 13, 34	0.688 14, 15	0.707 32	0.722 24	0.734 1
°A.P.I.	340**	247	147.0	119.8	110.8	94.9	92.7	81.6	74.2	68.6	64.5	61.3
Lb. per Gal. @ 60° F.	2.5**	3.11	4.23	4.69	4.86	5.20	5.25	5.53	5.73	5.89	6.01	6.11
Gal. per Lb. Mol @ 60° F.	6.4**	9.64	10.41	12.38	11.94	13.84	13.71	15.57	17.47	19.38	21.31	23.25
Density of Vapor 60° F. 14.696 Lbs./sq. in. Abs.***												
Specific Gravity (Air = 1.00)	0.554	1.038	1.522	2.006	2.006	2.491	2.491	2.975	3.459	3.943	4.428	4.912
Lb./M. Cu. Ft.	42.27	79.23	116.2	153.1	153.1	190.1	190.1	227.1	264.0	301.0	337.9	374.9
Cu. Ft. Vapor/Gal. Liq.	59**	39.35	36.45	30.65	31.79	27.41	27.67	24.38	21.72	19.58	17.81	16.32
Ratio, Gas Vol./Liq. Vol.* **	443**	294.3	272.7	229.3	237.8	205.0	207.0	182.4	162.5	146.5	133.2	122.1
Critical Conditions Temperature—°C.	− 82.5 34	+ 32.3 33, 36	96.8 30	134.0 34	152.0 39	187.8 34	197.2 34	234.8 34	267.0 17	296.0 34	322.2 33	346.1 33
Temperature—°F.	−116.5	+ 90.1	206.2	273.2	305.6	370.0	387.0	454.6	512.6	564.8	612.0	655.0
Pressure—Atmospheres	45.8 24	48.2 39	42.0 30	36.1 2	37.5 39	32.8 24	33.0 24	29.5 24	27.0 17	24.6 34	22.9 33	21.2 33
Pressure—Lb./Sq. In. Abs.	673	708	617	530	551	482	485	434	397	361	337	312
Density, Lb./Gal.	1.351 25	1.695 39	1.888 25	1.946 25	1.891 39	1.955 25	1.935 25	1.958 25	1.957 25	1.942 52	1.935 54	1.919 54
Volume, Cu. Ft./Lb. Mol.	1.586	2.371	3.123	3.990	4.130	4.930	4.98	5.88	6.84	7.86	8.86	9.91
Gross Heat of Combustion B.T.U./Lb. Vapor*	23,920 3	22,350 3	21,690 3	21,290 5	21,340 3	21,060 40	21,120 3	20,970 3	20,860 3	20,780 3	20,710 3	20,660 3
B.T.U./Cu. Ft.*	1,011	1,771	2,521	3,259	3,267	4,003	4,015	4,762	5,507	6,255	6,998	7,745
B.T.U./Gal. Liq. @ 60° F.		68,900	91,300	99,300	103,000 56	108,700	110,000 56	114,900 56	118,500 56	121,300 56	123,500 56	125,300 56
Explosion Limits—Lower % in-air	4.9-6-2 31	3.0-3.3 31	2.0-2.4 31	1.80 31	1.5-1.9 31	1.32 45	0.3-2.5 31	1.1-1.3 31	1.0-1.1 31	0.95 45	0.83 45	0.67 45
Upper % in air	12.7-16.0	10.6-15.0	7.0-9.5	8.44	5.7-8.5	——	4.5-7.5	4.2-6.0	3.6-6.0	——	——	——
Cu. Ft. Air to burn 1 cu. ft. gas	9.55	16.71	23.87	31.03	31.03	38.19	38.19	45.35	52.06	59.67	66.83	73.99
Heat of Vaporiz. 14.696 Lbs./sq. in. Abs. B.T.U./Lb. at B.P.	245 50	211 50	183 50	158 50	166 50	146 50	153 50	146 50	138 50	131 50	125 50	120 50
Specific Heat 14.696 Lbs./sq. in. Abs. C_p Vapor B.t.u./Lb. °F.	0.526 4, 47, 49	0.413 4, 47, 49	0.390 4, 47, 49	0.406 4, 47, 49	0.396 4, 47, 49	0.413 4, 47, 49	0.402 4, 47, 49	0.406 4, 47, 49	0.415 4, 47, 49	0.420 4, 47, 49	0.429 4, 47, 49	0.436 4, 47, 49
C_v Vapor B.t.u./Lb. °F.	0.402	0.347	0.346	0.373	0.363	0.387	0.376	0.384	0.397	0.404	0.415	0.424
$N = C_p/C_v$ B.t.u./Lb. °F.	1.306	1.189	1.128	1.088	1.090	1.066	1.070	1.057	1.045	1.040	1.034	1.028
C_p Liquid B.t.u./Lb. °F.	—	—	—		0.55@32 24		0.55 27	0.536 52	0.522 6	0.519	0.518 48	0.517 48
Vapor Pressure @ 100° F., Lb./Sq. In. Abs.	—	—	189.5 46, 10	73.5 28, 24	52.0 22, 18	20.3 24	15.5 11, 18	5.0 24, 18	1.63 24, 18	0.54 42	0.19 42	0.06 42
Aniline Point °F.				225.7 46	181.2 46	174.0 46	159.3 51	155.5 46	159.1 46	161.1 46	166.1 46	171.5 46
Refractive Index N_D^{20C}						1.3540 51	1.3577 51	1.3750 51	1.3878 51	1.3976 51	1.4056 51	1.4120 43

1. Sub-numerals shown with values refer to references in the bibliography. Where none are given, the values were calculated from those with references.

*Gross Heat on dry basis at 14.696 Lbs./sq. in. Abs. and 60° F. To convert to water saturation basis, multiply by 0.9825.
**Apparent values for dissolved Methane @ 60° F.
***Based on "perfect gas."

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BOOKS

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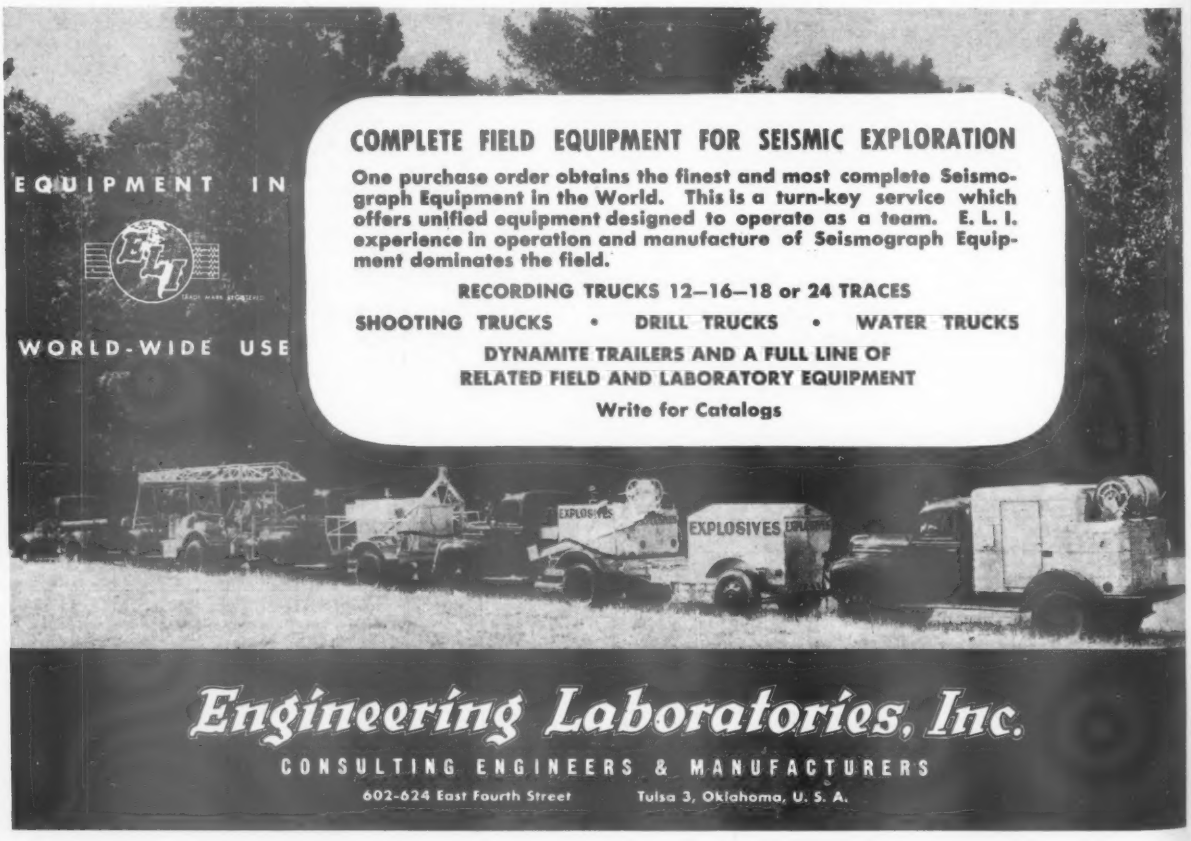
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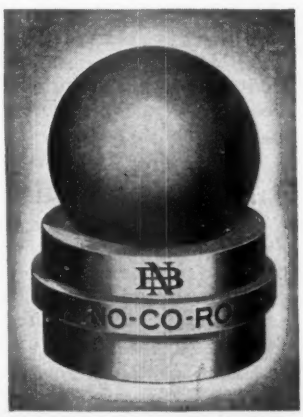

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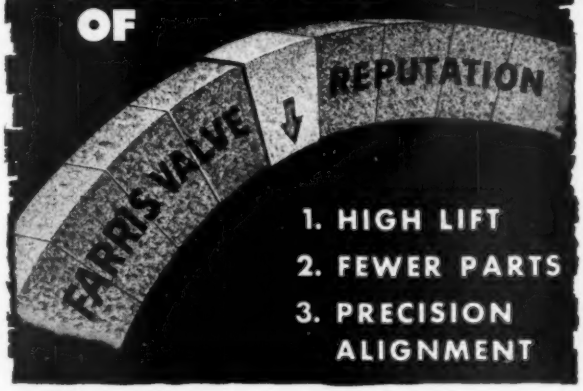

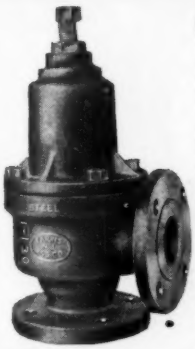

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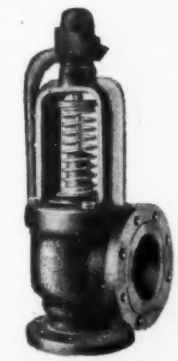

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The Reserve for Displacement of Oil By Gas at Declining Pressures

*by Park J. Jones**

PART 7 OF A SERIES

THE reserve for displacement of oil by gas at declining pressures may range from as low as 15 per cent of the oil initially in place up to about 45 per cent of the oil initially in place. This possible three-fold range of oil recovery by gas displacement at declining pressures results from the wide variation found in the field as to the properties of fluids, characteristics of reservoirs, and producing and operating practices. This article reviews the effects of gas-oil ratios, pressures, and location of wells on oil recovery by gas displacement. From the viewpoint of the optimum rate of production, the effect of distance from the source of gas to producing wells should be emphasized. Other things equal, the volume of gas required in order to achieve a desired oil recovery may be reduced significantly by providing sufficient distance between the source of gas and producing wells. The required distance can be provided under cooperative or unit operations.

Initial Oil Reserve vs. Gas-Oil Ratio

THE ultimate oil recovery from a reservoir is the initial reserve. One procedure on illustrating the initial reserve for displacement of oil by gas is shown in Fig. 7-1. In this procedure, the effects of fluid properties, reservoir characteristics and operating and producing practices are lumped together. Oil recovery in per cent of the oil initially in place is plotted against reservoir pressure. The latter is in per cent of the saturation pressure for oil. Denote the gas in solution at saturation pressure by unity. For example, unity might represent 500 cu. ft. of gas per barrel of oil initially in solution. Now, if the gas-oil ratio for cumulative recovery were 1,000 cu. ft. per bbl., the produced gas-oil ratio would be denoted by 1,000/500 or 2, and so on for any other gas-oil ratio. The curves in Fig. 7-1 show the initial oil reserve for a particular reservoir[1] and gas-oil ratios ranging from 1.67 up to 5.0. The corresponding oil reserve ranges from 15 per cent up to 45 per cent of the oil initially in place.

The curves in Fig. 7-1 are relative to no primary gas cap. However, a similar set of curves would be obtained* for reservoirs having a primary gas cap[2]. Oil recovery by gas displacement depends on gas-oil ratios. The source of the gas may be evolved solution gas, expanding gas cap gas, injected gas or some combination of the three sources. Irrespective of the source of gas, we have to control gas-oil ratios in order to achieve reasonable oil recoveries by gas displacement.

*Production consultant, Houston.

Oil Recovery from a Section of Pay

The initial oil reserve by gas displacement depends on a number of variables. Among these, reservoir pressure and temperature and the properties of gas and reservoir liquid are significant. These variables may be combined into one factor[3] as follows:

$$\text{Factor} = \frac{0.02bP\,\mu_L}{TZ\,\mu_G} \qquad (1)$$

where

- b = volume factor for reservoir liquid, barrels of space/barrel oil
- P = reservoir pressure, psia.
- T = reservoir temperature, °R
- Z = compressibility factor for gas
- μ_L/μ_G = ratio of reservoir liquid viscosity to gas viscosity.

The oil recovery from any section of pay within a given reservoir may be expressed[4] in terms of the factor defined by Equation 1 and the gas-oil ratio passing through the section. The curves in Figs. 7-2 and 7-3 show oil recovery from a section of pay by gas displacement. Oil recovery in per cent of the oil initially in place is plotted against the factor defined by Equation 1. Gas-oil ratios up to 20 M.c.f. per barrel of oil are included. The gas-oil ratios are exclusive to any gas in solution. In order to achieve an oil recovery from a given section of pay higher than the recoveries indicated by the curve for 20,000 cu. ft. of free gas per barrel of oil, the gas-oil ratio would have to be higher. But 20 M.c.f. per barrel is probably the economic limit for most reservoirs.

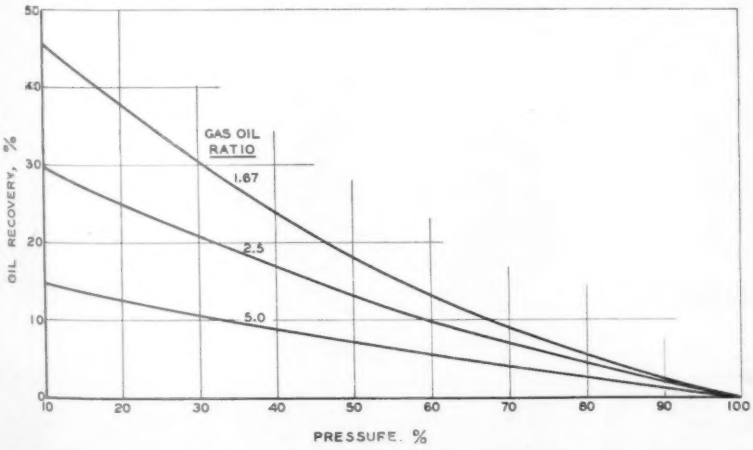

Fig. 7-1—Oil recovery vs. pressure and gas-oil ratio; pressure in per cent of saturation pressure; gas-oil ratio in terms of solution gas-oil ratio; oil recovery in per cent of the oil initially in place

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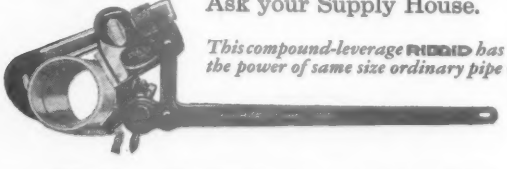

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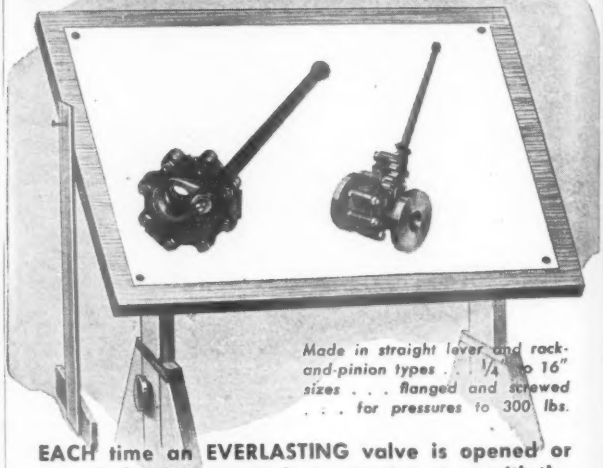

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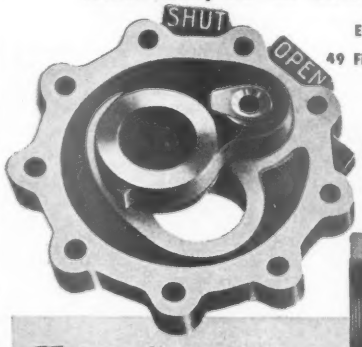

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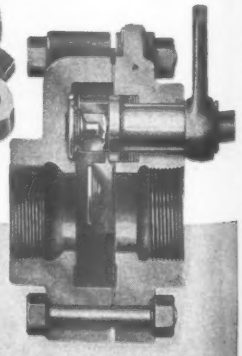

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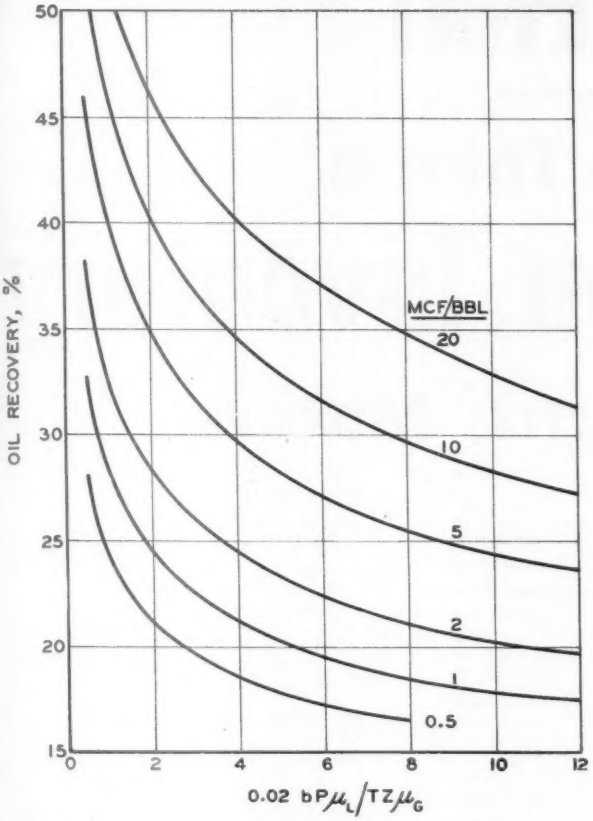

Fig. 7-2—Oil recovery from a section of pay by gas displacement vs. the properties of fluids, pressure and temperature for 10 per cent interstitial water; oil recovery in per cent of the oil initially in place. Numerals refer to the free gas-oil ratio in the production from a section of pay

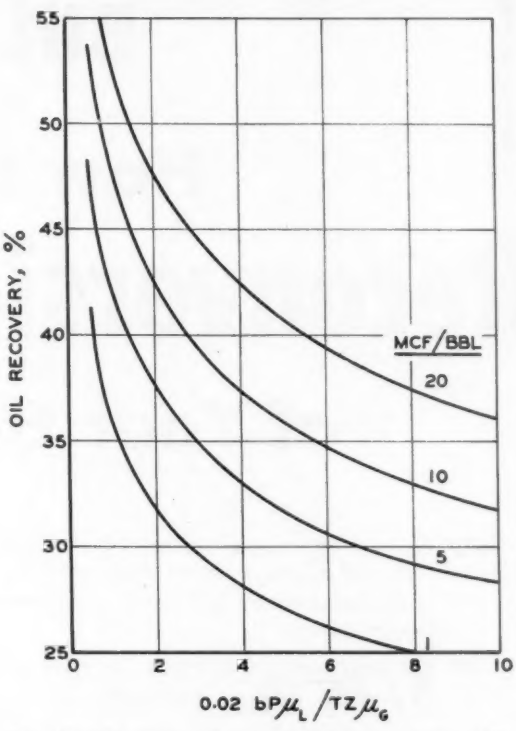

Fig. 7-3—Oil recovery from a section of pay by gas displacement vs. the properties of fluids, pressure and temperature for 40 per cent interstitial water; oil recovery in per cent of the oil initially in place. Numerals refer to the free gas-oil ratio in the production from a section of pay

On the other hand, the gas-oil ratios for some sections of pay are usually less than the gas-oil ratio at economic limit. For example, if 20 M.c.f. per barrel were the economic limit for the production from a well exclusive of the gas in solution, the gas-oil ratio for some sections of pay would be much less, say, 1 or 2 M.c.f. per barrel. But the oil recovery from a section through which only 1 or 2 M.c.f. per barrel are forced is significantly less than it would be for 20 M.c.f. per barrel. As a consequence, oil recovery from a reservoir by gas displacement is always less than the recovery defined for individual sections by the gas-oil ratio at economic limit.

The Limits of Oil Recovery

The lower limit of oil recovery by gas displacement U_1 is on the order defined by

$$U_1 = 20 - \frac{0.01bP\,\mu_L}{TZ\,\mu_G} \qquad (2)$$

where U_1 is the lower limit of (breakthrough) oil recovery from a section of pay just invaded by gas. Oil recovery is in per cent of the oil initially in place. The other symbols have the same meaning as those in Equation 1. As an example, if the factor $bP\,\mu_L/TZ\,\mu_G$ were 500, the recovery from a section just invaded by gas would be 15 per cent of the oil initially in place.

The upper limit of oil recovery by gas displacement $U_\circ$ from any section of pay is not likely to exceed the recovery defined by

$$U_\circ = 60 - \frac{0.03bP\,\mu_L}{TZ\,\mu_G} \qquad (3)$$

where $U_\circ$ is the maximum, or upper limit, of oil recovery from any section in per cent of the oil initially in place. For example, if the factor $bP\,\mu_L/TZ\,\mu_G$ were 500, the maximum oil recovery from any section would not be likely to exceed 45 per cent of the oil initially in place. The oil recovery from a reservoir for the conditions of this example would be greater than 15 per cent but less than 45 per cent. The recovery would depend on the distance moved by gas.

Oil Recovery from Reservoirs

Progressively higher gas-oil ratios are required in order to increase recovery from a given section of pay. Consequently, oil recovery from reservoirs relative to fixed gas-oil ratios depends on the distance gas can be displaced before reaching producing wells. In addition, oil recovery relative to a fixed gas-oil ratio and a fixed distance depends on the acre-feet of pay invaded by gas.

The data in Figs. 7-4 and 7-5 are illustrative examples. The lines in Fig. 5-4 are for a linear system having no convergence or divergence. Gas and oil are displaced through uniform cross-sectional areas. The lines in Fig. 5-5 are for a radial system having only areal divergence. Gas and oil are displaced through increasing cross-sectional areas. Pay thickness is uniform but the area invaded by gas per foot of gas-oil interface advancement increases with distance from an injection well.

The data in Figs. 7-4 and 7-5 are for a value of the factor $bP\,\mu_L/TZ\,\mu_G$ equal to 500, that is, for a particular reservoir pressure and a particular oil. But a similar set of data would be obtained if the value of the factor were, say, 250 or 1,000. Other things equal, the oil recoverable by a fixed volume of gas depends on sectional and areal convergence and on the distance gas can be displaced before reaching producing wells. Field experience

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How to Take a Reconversion Inventory of Your Electric Motors

As new manufacturing equipment becomes more widely available, and as you reconvert your production toward a peacetime basis, you may be faced with an unprecedented problem of inventory-taking.

You may have to determine — more quickly than such a job has ever been done before — the exact condition of every piece of existing equipment you propose to use in peacetime production.

For about four years, far greater emphasis has been placed on setting production records than on keeping maintenance records; condition of equipment is often unknown. Because much equipment has been worked during wartime three and four times as many hours a year as in peacetime, calendar age may mean nothing. And repair has often depended on American ingenuity and baling wire.

Here are some of the standards you need to determine which of your electric motors: (1) are okay as is, (2) need repair or new parts, (3) will shortly require replacement, (4) need reapplication.

These standards generally apply to all makes of motors; when in doubt on any motor, consult its manufacturer.

1 START YOUR INVENTORY WITH THE RECORDS

Begin your motor inventory with the history of each motor; you'll save much time and effort . . . you'll be guided quickly to the units which most need attention. Written records and the mental recollection of foremen and maintenance men are the source of this information.

Check the *master maintenance records* (though in most plants this file is out-of-date and incomplete, because of wartime pressure on production); and get *reports from foremen* (in a small plant, it may be possible to interview each man; in a large plant, it may be more efficient to distribute blank forms, such as the "MOTOR CHECK LIST" on opposite page.)

Look into the service to which the motor has been subjected in wartime: has it been overloaded? underloaded? worked 3 shifts daily? allowed to go to work in spray, steam, flood, acids? has it had mechanical injury? has it stood idle, collecting moisture and dirt?

Knowing the answers to these questions will help you spot motors that may soon give you trouble . . . you can start your inventory there.

NOTE: All new motors built during wartime, under WPB limitation orders, contain minimum amounts of critical materials. Thus, unlike many prewar motors, they have been incapable of withstanding continued overload operation in the way you've come to expect high-grade American motors to do. Moreover, you've had to take motors at the ratings you could get, without much regard to the exact requirements of the application. Thus, many motors have been running harder and at higher temperatures than nameplate ratings call for. Obvious result of this combination of factors is shortened insulation life. So—*expect* trouble where wartime motors are misapplied.

2 THEN CHECK MOTORS IN OPERATION

Obviously, the easiest and most practical measure of a motor's present condition is the way it is now operating. You can't learn all you need to know about its probable future performance by observing it in use, but a motor does reveal certain symptoms of trouble while doing its job.

Check the power line voltage and frequency and compare with the voltage and frequency of the motor as stated on the nameplate. To perform properly, a motor must be supplied from a line whose characteristics correspond with those for which the motor was designed.

Check rpm — hand revolution counter makes this easy. Just remove cap, hold counter against end of shaft, and take a timed reading; compare with nameplate rating.

Take temperature readings — not by the "blistered hand" or "touch and yell" system, but *accurately*, with *thermometers*.

Find the temperature of the *motor* by taping or cementing thermometer to the stator iron . . . take the reading, and add 15°C. (The difference between the heat on the outside surface and the possible heat of the hottest part inside).

Compare motor temperature with temperature rise rating on the nameplate. Normally a 40° rise is considered acceptable; top temperature usually should not exceed 80°C.

Take the temperature of *bearings*

either by taping or cementing thermometer to the bearing housing, or by inserting it into the oil well. In general, maximum safe bearing temperature is 96°C. (Bronze bearings may take somewhat higher temperature safely. When in doubt, consult motor manufacturer.)

Listen for — EXCESSIVE HUM. May be caused by uneven air gap, and may call for replacement of bearings. Or it may be caused by loose laminations or unbalanced rotor. Note this hum while inspecting motor in operation; check for cause later, while making inspection of parts.

Note — VIBRATION. If excessive, this may be caused by either misalignment between shafts of motor and driven machine, or through transmission of vibration in driven machine to the motor. Run motor disconnected for check. *If vibration follows motor repair,* it's probably due to out-of-balance rotor.

Listen for — RAPID KNOCKING. May be caused by misalignment, with shoulder of shaft pounding against bearing end; realign set . . . and note this knock, check bearings when making inspection of parts.

NOTE: if excessive vibration, knock, or squeal follows re-assembly of motor, cause may be incorrect axial adjustment for float.

Look for — EXCESSIVE SPARKING OF BRUSHES. Check for cause when motor is taken down for inspection.

3 THEN CHECK THE PARTS

If time permits, you'll want to give detailed inspection to *every* motor that's been in strenuous service these past years. (You may be able to work this into your regular production schedule. Set up a system so that the electrical department may be notified whenever a machine is to be down. Disassembly and inspection of motors can be done then.)

And in cases where *history* of the motor or its *operating characteristics* indicate the likelihood of present or future trouble, you'll surely want to take a close look at the parts themselves.

A. FIRST — disconnect motor leads and uncouple motor from driven unit.

B. THEN — if excessive hum was noted while motor was in operation, use feeler gauge to check air gaps between rotor and stator. Difference of more than 20% indicates overworn bearings, sleeves, or journals. Check bearings as indicated below.

C. REMOVE end housing and lift rotor out, using a sling if rotor weighs over 75 pounds. If rotor is dirty, clean it with air hose (pressure not over 30 lbs), bellows, or vacuum cleaner, or swab it with non-inflammable solvent.

D. INSPECT rotor for abrasion; corrosion; discoloration (caused by overheating.) In squirrel cage motor, check also for loose or broken rotor bars.

E. IF ROTOR or armature is the wound type, check for loose banding. If any looseness is noted, band with new wire before putting motor back in service. If band assembly has not failed extensively — perhaps only a solder failure at one or two clips — repair can usually be effected simply by resoldering. Major rebanding, however, is a job for experts.

F. CHECK INSULATION — As motors get older, or as they operate continuously at high temperatures, insulation on coils tends to become brittle. It may start flaking off, cutting its insulating value. This may not affect motor performance seriously *except* that it may lead to short circuits or grounds, excessive vibration (out-of-balance rotor), or clogging of the air vents (leading to overheating) or abrasive wear from fallen particles. SO — check insulation visually . . . see whether pieces of insulation have torn or flaked off . . . and also make a megger (megohmeter) test. For a clean, dry motor at 75°C, insulation resistance in megohms, according to the American Standards Association, may be found by the formula:

$$\frac{\text{Rated voltage of motor}}{\frac{\text{Rating in KVA}}{100} + 1000} = \text{Insulation Resistance in Megohms}$$

G. CHECK BEARINGS — to remove ball bearings, use a puller, applying pressure to the inner race only, maintaining uniform pull all around, to avoid distorting the bore of the race.

Check bearings for excessive wear, scoring, or pitting.

To examine *anti-friction bearings,* first clean them thoroughly with kerosene to remove all old grease and dirt particles; then hold inner race and rotate outer race, feeling for roughness of action and listening for noise.

Inspect sleeve bearing clearance with feeler gauge. Normal clearances may be computed this way: take 0.003" as the basic tolerance . . . then add 0.001" for each inch of shaft journal diameter. Inspect journal surfaces; if scoring seems excessive, consider replacing.

If bearing shows no excessive wear, the hum of the motor in action may result from out-of-balance rotor or armature. Check this on parallel bars.

H. CHECK for cause of sparking. Check mechanical condition of parts. (For details, see Reconversion Inventory Kit, offered below.)

4 NOW MAKE THE APPRAISAL

With all the facts in hand — history, operating characteristics, condition of parts — your electrical department will be best prepared to assign this motor to its new role in reconverted production. Use check list forms like this —

RECONVERSION INVENTORY CHECK LIST FOR ELECTRIC MOTORS

for easy inspecting and appraising. Your nearby Allis-Chalmers district office or distributor will supply free copies of this Check List in whatever quantity you require.

CENTRIFUGAL PUMPS, V-BELT DRIVES, NEED INVENTORY TOO!

To speed your Reconversion Inventory of the most common industrial units, Allis-Chalmers has prepared a Reconversion Inventory Kit covering Electric Motors, Centrifugal Pumps, and V-Belt Drives. No big package, this kit is simply a set of Fact Sheets and Check Lists covering each type of unit, with suggestions for inventory procedure as outlined in these pages, but in somewhat greater detail.

A 1901

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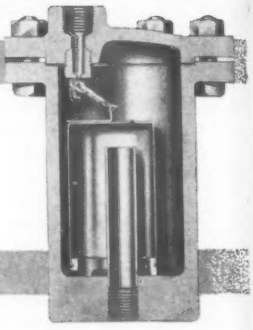
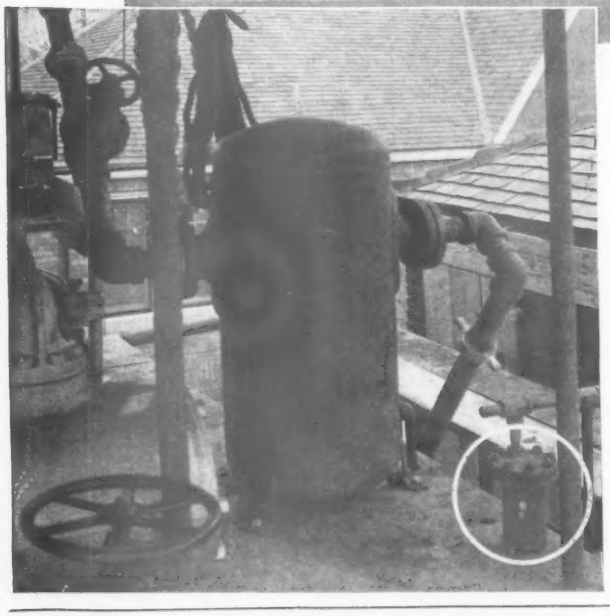


Armstrong Forged Steel Trap on rotary drilling rig.



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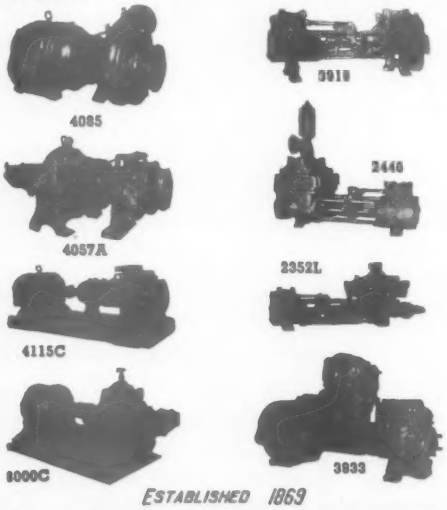

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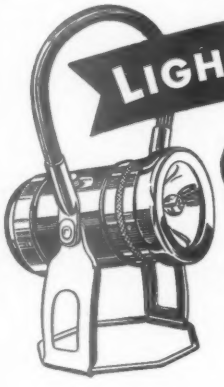

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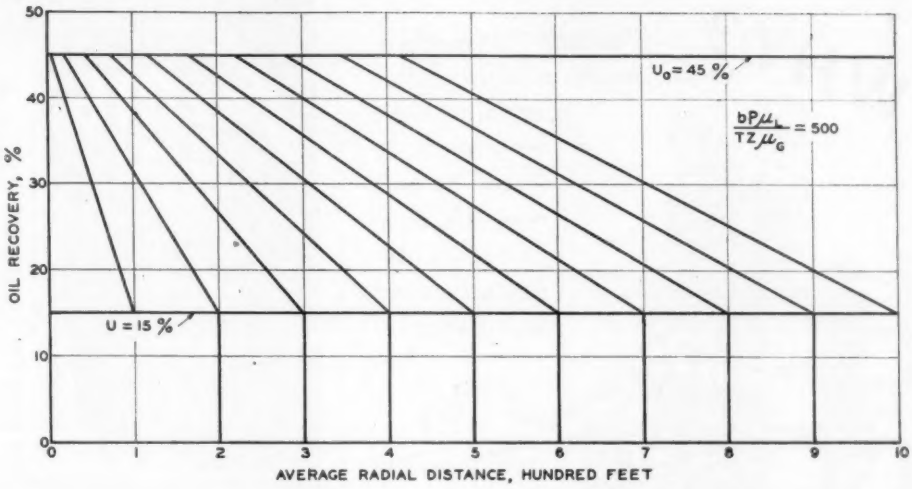

Fig. 7-4 — Illustrating a method for estimating the approximate oil recovery by gas displacement from a linear system; oil recovery in per cent of the oil initially in place; gas-oil interface advances from left to right

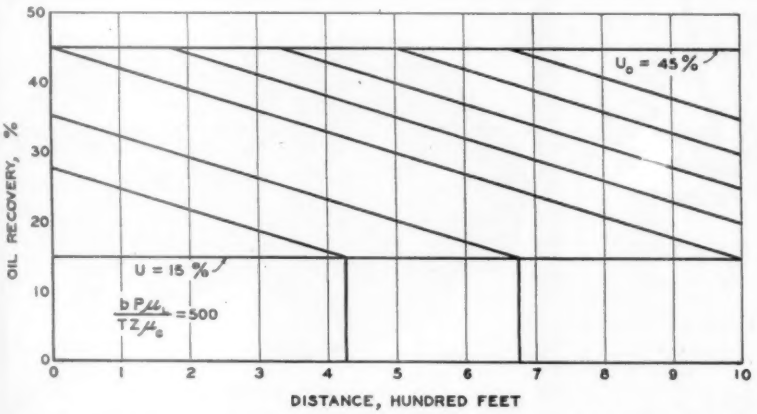

Fig. 7-5—Illustrating a method for estimating the approximate oil recovery by gas displacement from radial systems relative to injection wells; gas-oil interface advances from left to right

indicates that the distance between the sections of breakthrough and maximum recoveries is on the order of 1,000 ft. aside from sectional and areal convergence. If there be a divergence of reserve, this distance is less than 1,000 ft. If there be convergence of reserve, the distance is greater than 1,000 ft.

Denote the total acre-feet of oil pay in a reservoir by unity. Let J equal the ratio of acre-feet of pay invaded by gas to total acre-feet. Let D equal the ratio of the oil displaced from the region invaded by gas to the oil initially in place. Then the initial reserve U, which is the ultimate oil recovery from a reservoir, is given[5] by

$$U = \frac{S}{b}(DJ) \qquad (4)$$

where S is the barrels of reservoir liquid initially in place and b is the volume factor for oil. Equation 4 states that the initial oil reserve is equal to the product of three factors; namely, S/b, the oil initially in place, J, the fraction of reservoir space invaded by gas, and D, the fraction of the oil displaced from the region invaded by gas. The value of J for the region invaded by injected gas, or by an expanding cap gas, is higher than the value of J for evolved solution gas, see Figs. 7-2 and 7-3. Applications of Equation 4 require maps on the acre feet of pay invaded by gas. No simple illustrative examples can be given. We might note, however, that the acre feet of pay invaded varies approximately as the square of the distance between the source of gas and producing wells.

Cooperative and Unit Operations

Reservoirs having comparatively high permeability or steep dip can be produced more advantageously in the downdip direction. In order to minimize bypassing of oil, the downdip rate of gas-oil interface advancement should not be significantly higher than the downdip rate of oil displacement by gravity at, say, 20 per cent free gas saturation. In order to minimize unequal rates of interface advancement as between two pay intervals, distances must be maintained between the source of gas and producing wells. Distances between the source of gas and producing wells also need to be maintained in order to minimize fingering of gas into producing wells. The required distances can be provided under cooperative or unit operations.

Declining reservoir pressure may be accompanied by a threefold up to as much as a tenfold decrease of well-producing capacity. Declining reservoir pressure tends to force the drilling of additional wells, that is, overdevelopment of reservoirs. But overdevelopment is not likely to increase the initial oil reserve. It tends to maintain well-producing capacity only. Two or four times a given number of wells can produce at a uniform rate for a longer period of time than the given number of wells. Maintenance of the rate of production from a reservoir by drilling a comparatively large number of wells usually results in a loss relative to maintaining pressure. It can be shown that the optimum rate of oil production by gas displacement at declining reservoir pressures depends primarily on either not producing gas cap gas or else on injecting produced gas. Both of these producing methods may require cooperative operations, but under some conditions unit operations may be more advantageous.

References

1. The Oil and Gas Journal, May 5, 1945, p. 103.
2. The Oil and Gas Journal, May 12, 1945, p. 124.
3. The Oil and Gas Journal, April 7, 1945, p. 91.
4. The Oil and Gas Journal, April 14, 1945, p. 125.
5. The Oil and Gas Journal, Nov. 4, 1944, p. 53.

J. J. Russell, for the past 5 years head of the geological department for Sinclair Prairie Oil Co. in Wichita Falls, Tex., has resigned to become a consultant there.

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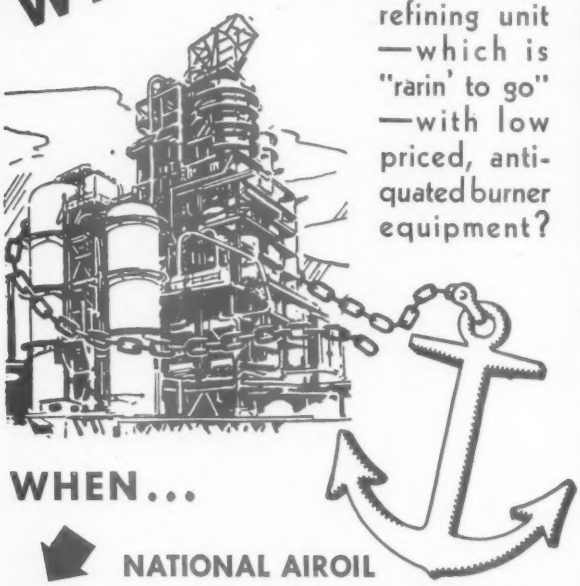

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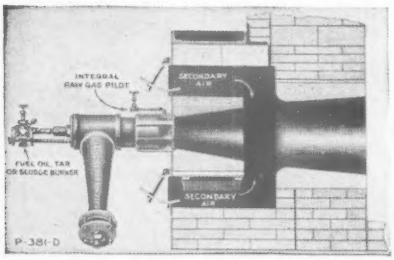

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The fluorescence test is described as sensitive enough to indicate amounts of uranium that would ordinarily be detected in the most precise chemical methods, yet is not so sensitive as to give positive reactions with mere traces of uranium. Since its development the test has been used on hundreds of samples of various kinds and has been found satisfactory in all cases.

The fluorescence test for uranium was developed by Bureau chemists at the Intermountain Experiment Station at Salt Lake City, Utah, during investigations in the western states on deposits of vanadium with which uranium often is associated.

Until the development of foreign sources of uranium, low-grade ores of the western states were utilized mainly as a domestic source of uranium, but in the past considerable difficulty was experienced in the determination of uranium in the complex ores.

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A copy of the publication, Report of Investigations 7337, "Fluorescence Test for Uranium," by Claude W. Sill and H. E. Peterson, may be obtained by writing the Bureau of Mines, Department of the Interior, Washington 25, D. C.

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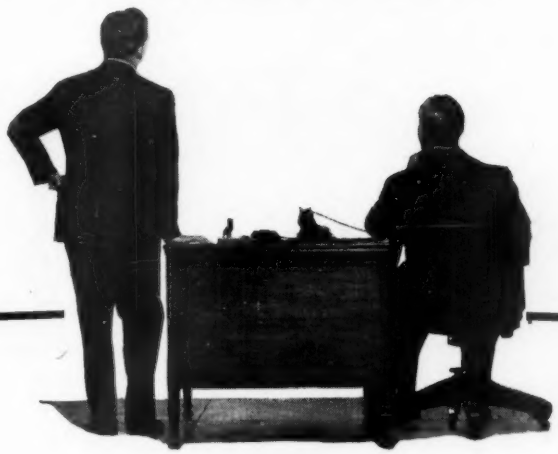

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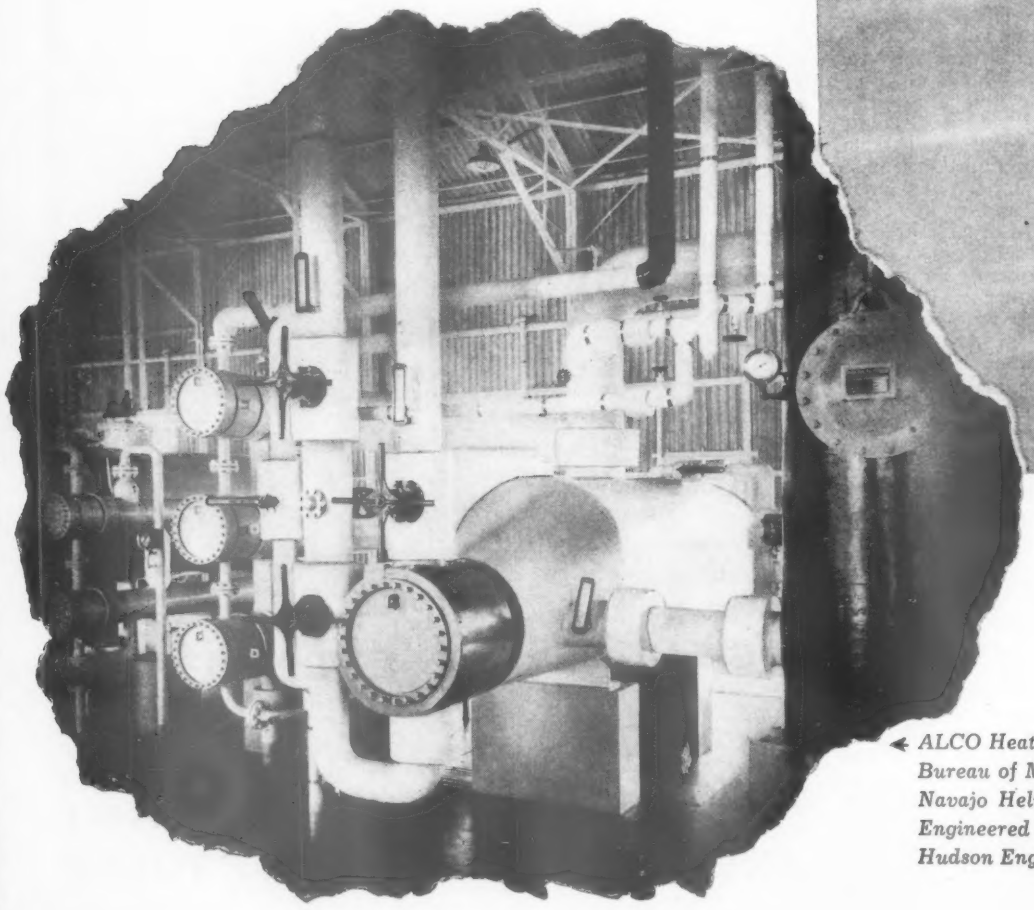
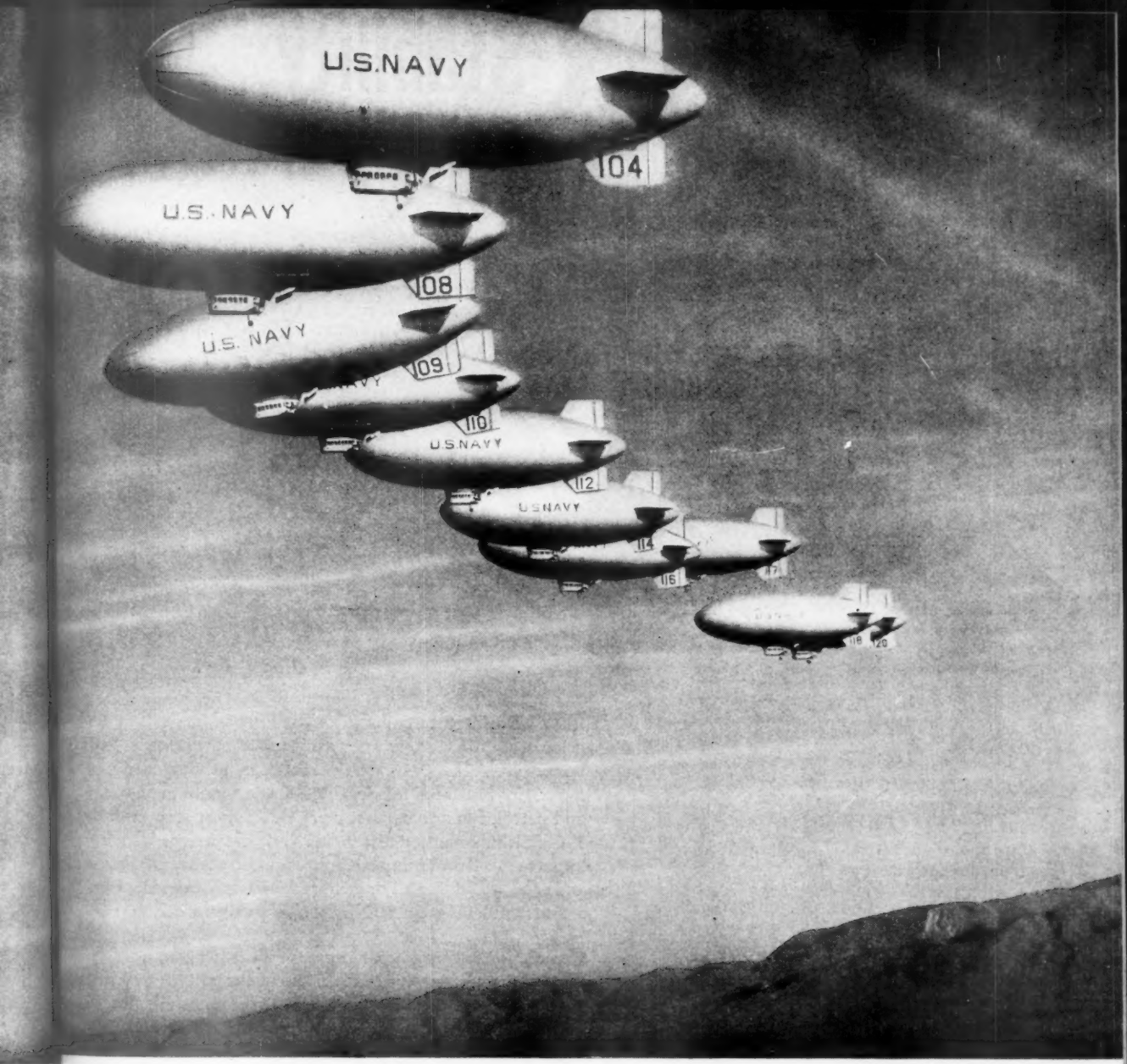


ALCO Heat Exchangers in Bureau of Mines, Navajo Helium Plant, Engineered and built by Hudson Engineering Corporation



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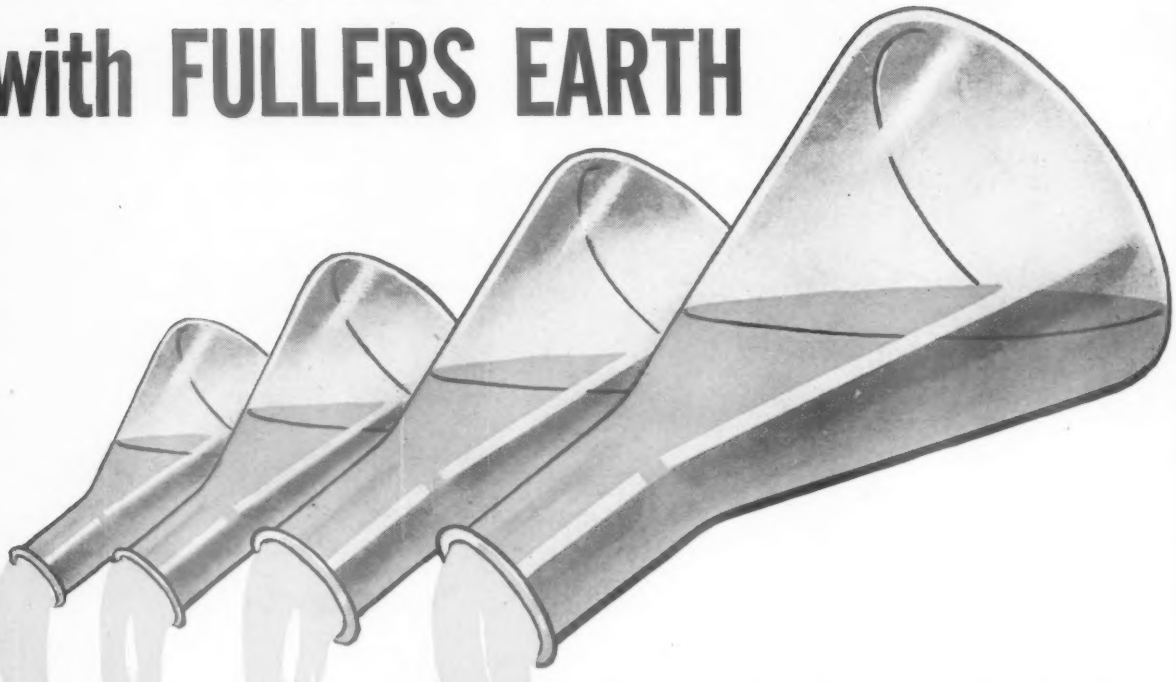

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Catalysts Important to Refining Technology

(Continued from page 113)

combination hydrogenation-isomerization catalyst is made (5-251) with $AlCl_3$ and HCl, with small amounts of reduced nickel and copper, operating at 100°-300° F. A finely divided metallic nickel catalyst is made (5-270) by alloying nickel with another, more electropositive metal such as magnesium. The alloy is treated with 20 per cent acetic acid to remove the magnesium from the unattacked nickel. Ipatieff and Haensel (5-271) hydrogenate hydrocarbons by mixing 20-60 per cent of hydrogen (by weight) with hydrocarbons such as olefins, and treating at 470°-700° C. (878°-1,292° F.), with a catalyst made by heating equal parts of alumina, zinc, and copper in air at 500°-600° C. (932°-1,112° F.). Hydrogenated aromatic amines such as cyclohexylamine from aniline may be made (5-273) by hydrolyzing an alloy, in an organic liquid, made of a catalytically active metal such as nickel, cobalt or iron with a hydrolyzable metal such as magnesium, using only the stoichiometrical amount of water to hydrolyze, then used to treat (reduce) the charge stock under optimum conditions.

A highly active hydrogenation catalyst is prepared by using a nonporous base material such as kieselguhr or quartz on which an oxide of a noble metal is precipitated by coating the base with the chloride of the metal—Pt or Rh—and precipitating with an alkali nitrate salt (5-276). For destructive hydrogenation a catalyst is made (5-282) by precipitating or depositing tungsten sulfide coating on a base of SiO_2 which has 30 per cent of pores of 2 millionths of a micron diameter. Another destructive hydrogenation catalyst is made (5-283) of iron sulfate, oxalate or tartrate or complex ammonium salts of titanium, used at 20 atmospheres (300 psi.), and above 350° C. (652° F.). A double-reaction system is proposed by one researcher (5-290) using a catalyst of nickel, cobalt or platinum to hydrogenate low-octane-number gasoline at 475°-525° F., followed by treatment at 525°-600° F. with a dehydrogenation catalyst of 8 per cent Cr_2O_3, 92 per cent alumina.

Anhydrous hydrofluoric acid or boron trifluoride (5-294) is claimed for treating olefinic fractions to saturate them and improve antiknock rating. Hydrogen sulfide (5-303) is used as a promoter with catalysts such as Fe, Co or Ni, with concentrations varying between 1 and 15 per cent, using that which gives optimum results. Supported catalysts are made (5-302) by mixing calcium silicate with a solution of an Al or Mg salt at elevated temperature, filtering, washing, and drying the mass, and reheating before use. Another catalyst is made (5-305) by soaking silica gel in a solution of Al or Mg salt, mixing while the metal of the salt is being precipitated from the solution, drying the mass and heating to 482°-1,472° F. Additional heavy metal salts such as sulfides are precipitated on this base. Motor fuels may be hydrogenated, says a German patent (5-307), by treating with iron or manganese sulfides in order to prevent "resinifying" or gum formation. A multipurpose catalyst, claimed to be effective as a cracking, hydrogenating or dehydrogenating catalyst, is prepared (5-309) by treating and other metal sulfides with oxygen at temperatures below 932° F., then with ammonia or ammonium sulfide in such amount that all will be absorbed by the base; this is heated to reduce the sulfides to sulfo salts, then at a higher temperature to decompose these sulfur salts, in a stream of hydrogen.

Newer developments in hydrogenation have been made during the war period, which have not been disclosed publicly because of military secrecy. It is reported that satisfactory hydrogenation can now be accomplished at lower temperatures and pressures. The Bergius-type or the I.G.-Farben type of process for hydrogenation of coals and tars has required temperatures above 900° F. and pressure of 2,000-3,000 psig. it is understood, an expensive operation; new catalysts are said to reduce these conditions very advantageously.

Aromatization-Cyclization Catalysts

One of the "synthetic" reactions of prior interest in recent years has been the aromatization—cyclization and dehydrogenation—of hydrocarbons to produce aromatics such as benzene and toluene from petroleum raw materials. During the war large quantities of benzene and more of toluene have been produced from noncoal-tar sources, almost entirely petroleum. Some of this result has come from catalytic operations but probably more as result of byproduct yields from other operations such as hydroforming, thermal and catalytic cracking and "treating."

Aromatization catalysts are generally allied closely to dehydrogenation catalysts and operations, as is expectable from the nature of the reactions. Simple cyclization of paraffins or olefins may be carried out by dehydrogenation of nonadjacent carbon atoms in the chain and subsequent juncture of the carbons to form a ring of any given number of carbon atoms, more generally five or six, yielding a cycloparaffin. This paraffin may then be dehydrogenated to form the benzene ring in the case of six-membered rings. Or the original paraffin or olefin may be broken into alkyl or alkylene groups of one or more carbon atoms which are regrouped into aromatic rings with or without side chains.

Molybdenum oxide, Mo_2O_3, or alumina, Al_2O_3, may be used as catalysts (6-310) to form ortho-xylene from isooctane, giving a 25 per cent yield along with considerable "cracking." Molybdic and chromic sulfides are also used as desulfurization catalysts, supported on alumina. Copper chromite also shows good desulfurizing effect when used on an alumina carrier. An aromatizing catalyst of zirconium oxide and thorium oxide, ThO_2, gives good yields of toluene from heptane at temperatures above 80° C. (176° F.) (6-311). An effective aromatizing - dehydrogenating catalyst is made (6-313) by partially reducing chromic oxide, Cr_2O_3, in a stream of hydrogen at 800° F. or higher; regeneration of this catalyst when spent is best done by heating with oxygen then in a stream of hydrogen.

Catalysts of chromia, alumina, and cobaltic oxide (6-314) form alkyl benzenes from paraffins, and show olefin steps during the formation of aromatics. A catalyst claimed to be very effective is made by coprecipitating cobalt and aluminum hydroxides, and reducing them to form metallic cobalt interspersed in the alumina, and operating at 300°-400° F. (6-315). A similar catalyst is prepared (6-320) by coprecipitating alumina and chromia along with 2-15 per cent of copper oxide, CuO, and used at 700°-1,250° F. to effect aromatization of nonbenzenoid hydrocarbons.

These metals, oxides, etc., include the greater number of aromatizing catalysts. To them are sometimes added small amounts of BF_3 (6-326), of Zr, Hf, Th, or Ce oxides (6-331), of H_3PO_4-on-pumice (6-332), and of other possible materials as promoters or co-catalysts. The catalytic part of the aromatization field has been less intensively developed than have thermal methods for the same purpose.

Miscellaneous Catalysts

Miscellaneous catalysts include those effecting desulfurization, oxidation, "sweetening" of motor fuels, gum removal such as the Gray process for treating cracked or straight-run vapors with fuller's earth or other adsorbent materials, and various other reactions trending into the chemical field. Gasoline fractions may be desulfurized with a nickel hydrogenation catalyst while maintaining a ratio of hydrogen to hydrocarbons of 6:1 when S content of the material is 0.15 per cent or less; of 9:1 when S content is 0.2 per cent or more (7-335). A "sweetening" catalyst is made (7-336) by mixing equimolecular solutions of fer-

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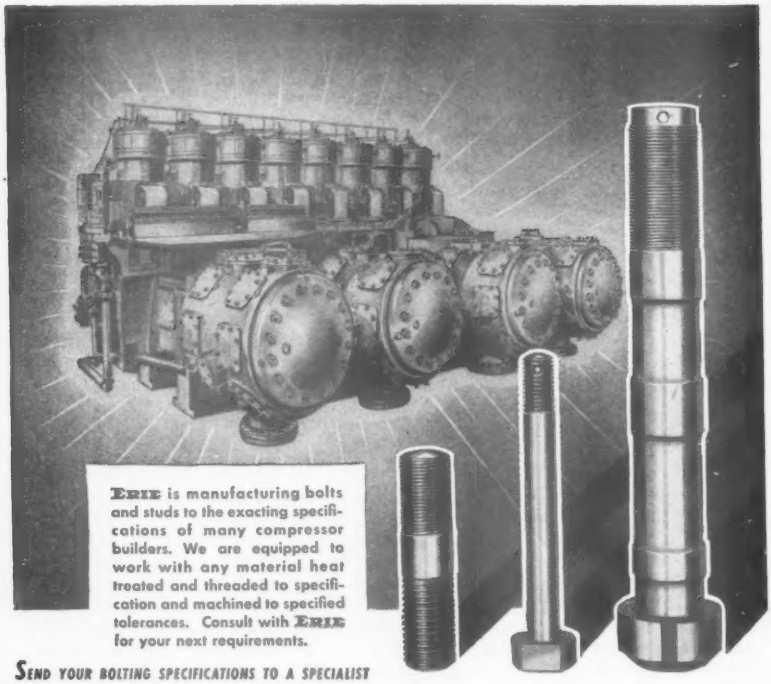

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Aliphatic acids may be made from paraffins by oxidizing the latter with a catalyst composed (7-341) of 0.2 per cent Mn stearate, 2 per cent aliphatic acids, and 1.5-3 per cent of sodium carbonate, operating at 125° C. (257° F.) in glass or aluminum equipment. Oxidation of olefins, cycloolefins, etc., is accomplished satisfactorily with osmium tetroxide as catalyst and alkali chlorates as oxidizing agents (7-342).

Bibliography

Hydrogenation-Dehydrogenation

Reference, publication and date, or date of patent issue, and nature of catalyst.

5-245. Catalysts of Coal Hydrogenation—J. Soc. Chem. Ind. Vol. 63, p. 1 (1944). Tin-iron.

5-246. Dehydrogenation of Butane.—Compt. Rend. Acad. Sci. U.S.S.R. Vol. 32, p. 135 (1941). Chromium oxide.

5-247. Transformation of Hydrocarbons—Jr. Gen. Chem. U.S.S.R., vol. 13, p. 202 (1943). Vanadium or its oxides.

5-248. Nickel Catalysts—Chem. Zentr. 1942, II, p. 623. Nickel metal.

5-249. U. S. 2,287,022, June 23, 1942, Mn oxide-alumina.

5-250. U. S. 2,288,320. June 30, 1942. Chromic oxide.

5-251. U. S. 2,290,189. July 21, 1942. $AlCl_3$-HCl Ni or Cu.

5-252. U. S. 2,294,414. Sept. 1, 1942. Precipitated metal-chromate.

5-253. U. S. 2,296,406. Sept. 22, 1942. Mo oxide, alumina.

5-254. U. S. 2,300,971. Nov. 3, 1942. Alumina.

5-255. U. S. 2,303,118. Nov. 24, 1942. "Hydrogenation catalyst".

5-255a. U. S. 2,304,168. Dec. 8, 1942. Alumina.

5-256. U. S. 2,307,715. Jan. 5, 1943. Cr oxides, sulfides, mixed.

5-257. U. S. 2,311,979. Feb. 23, 1943. Alumina, Chromia.

5-258. U. S. 2,312,572. March 2, 1943. Gel-type chromia.

5-259. U. S. 2,313,162. March 9, 1943. V,Cb, or Ta oxides, on Al_2O_3.

5-260. U. S. 2,315,107. March 30, 1943. Alumina, plus Fe, Ni, Co oxides, H_2S.

5-261. U. S. 2,315,144 March 30, 1943. MgO-$ZnSO_4$-Pb Chromate.

5-262. U. S. 2,315,506. April 6, 1943. ZnO; then bauxite, WO_3 or alumina.

5-263. U. S. 2,320,118. April 25, 1943. Alumina plus alkalizer, as KOH.

5-264. U. S. 2,322,025. June 15, 1943. Cr, Mo, V oxides, on alumina.

5-265. U. S. 2,322,857. June 29, 1943. Alloy, as KA2S, and Cr oxide.

5-266. U. S. 2,322,863. June 29, 1943. Mo, Cr, W, U, V oxides on alumina.

5-267. U. S. 2,325,287. July 27, 1943. Al, Cr, & Ce oxides.

5-268. U. S. 2,325,611. Aug. 3, 1943. Mo or Cr oxide, on alumina.

5-269. U. S. 2,325,911. Aug. 3, 1943. Mo or Cr oxide, beryllium oxide, on alumina.

5-270. U. S. 2,326,275. Aug. 10, 1943. Ni-Mg alloy.

5-271. U. S. 2,327,189. Aug. 17, 1943. Alumina, Zn & Cu oxides.

5-272. U. S. 2,327,938. Aug. 24, 1943. $AlCl_3$-isobutene complex.

5-273. U. S. 2,328,140. Aug. 31, 1943. Mg, with Ni, Co or Fe.

5-274. U. S. 2,328,754 and 2,328,755. Sept. 7, 1943. SiO_2-Al_2O_3, and ZrO_2.

5-275. U. S. 2,330,804. Oct. 5, 1943. Phosphomolybdic acid in alumina.

5-276. U. S. 2,331,915. Oct. 19, 1943. Pt or Rh oxide on quartz, kieselguhr.

5-277. U. S. 2,334,159. Nov. 9, 1943. Oxides of Si, Al, Zr, Mo.

5-278. U. S. 2,335,488. Nov. 30, 1943. Al or Fe oxide on activated Carbon.

5-279. U. S. 2,336,054. Dec. 7, 1943. Tin naphthenate.

5-280. U. S. 2,337,190 and 2,337,191. Dec. 21, 1943. Alumina, silica, and Cr, Ce, K, Rb or Cs oxides.

5-281. U. S. 2,337,628. Dec. 28, 1943. Al or Cr hydroxides mixed with agar or other colloid, dry.

5-282. U. S. 2,337,944. Dec. 28, 1943. Tungsten sulfide on SiO_2.

5-283. U. S. 2,338,119. Jan. 4, 1944. Fe sulfate, oxalate, tartrate, or $Ti(NH_4)$—salts.

5-284. U. S. 2,339,349. Jan. 18, 1944. Green Cr_2O_3 ppted. on bauxite.

5-285. U. S. 2,341,995. Feb. 15, 1944. Oxides and metals of Cu, Fe, Ni, Co, Ag, Sn, Pb, Hg, Mo, W and V.

5-286. U. S. 2,344,244. March 14, 1944. Sulfides of Groups I, VI, and VIII metals.

5-287. U. S. 2,344,330. March 14, 1944. Powdered Al_2O_3 impregnated with Cr_2O_3 & MgO.

5-288. U. S. 2,346,657. April 18, 1944. Alumina, chromia, and isomerization catalyst of SiO_2 & ZrO_2.

5-289. U. S. 2,347,256. April 25, 1944. Cr_2O_3, first stage; TiO_2, Al_2O_3, bauxite with As comp. or H_2S.

5-290. U. S. 2,348,557. May 9, 1944. Hydrog., Ni, Co or Pt; dehydrog., chromia-alumina.

5-291. U. S. 2,351,094. June 13, 1944. Cr oxide, with alkali metal comp.

5-292. U. S. 2,352,791. July 4, 1944. Ni—or Fe-asbestos—Hydrogenation.

5-293. U. S. 2,354,892. Aug. 1, 1944. Alumina impregnated with Tungstic oxide.

5-294. U. S. 2,356,357. Aug. 22, 1944. HF or BF_3.

5-295. U. S. 2,356,701. Aug. 22, 1944. Cr_2O_3-Al_2O_3; or Ni metal on pumice.

5-296. U. S. 2,358,879. Sept. 26, 1944. Metal of Fe group on siliceous material.

5-297. U. S. 2,360,689. Oct. 17, 1944. Metal and its oxide, as Cu, Fe, Ni, Ag, Sn, Bi, Mo, W & V, etc.

5-298. Br. P. 546,709. July 28, 1942. Alumina, chromia.

5-299. Can. P. 413,472. June 29, 1943. NiO, supported, from Ni nitrate.

5-300. Can. P. 425,645, Feb. 20, 1945. W & Ni sulfides.

5-301. Ger. P. 707,531. May 21, 1941. "Heavy metal comps." on fuller's earth.

5-302. Ger. P. 712,505. Sept. 25, 1941 Ca silicate, coated with Al or Mg oxide.

5-303. Ger. P. 713,792. Oct. 23, 1941. H_2S added as promoter to Fe Ni or Co hydrogenation catalyst.

5-304. Ger. P. 728,674. Oct. 29, 1942. General hydrogenation process.

5-305. Ger. P. 730,291. Dec. 10, 1942. Al or Mg oxide on silica, from salts, plus heavy metal sulfides.

5-306. Ger. P. 734,151. March 11, 1943. Fe & Mn sulfides as hydrogenation catalysts.

5-307. Ger. P. 734,993. April 1, 1943. Co oxide on diatomaceous earth (Fischer-Tropsch).

5-308. Ger. P. 735,417. April 8, 1943. Beta-naphthalene sulfonic acid, monohydrate.

5-309. Ger. P. 739,269. Aug. 12, 1943. Si, metal sulfides, NH_4 sulfide, heat-decomposed.

Aromatization Catalysts

6-310. Cyclization of Hydrocarbons, J. Inst. Pet. vol. 28, p. 179 (1942). Mo_2O_3 on alumina.

6-311. Catalytic Dehydrogenation—Chem. Zentr. 1942 II, 1430. Zr_2O_3-ThO_2.

6-312. Pyrolysis of C_2H_6 on SiO_2 Gel-Chem. Zentr. 1943 II, 1783. Silica Gel.

6-313. * * * Aromatization of Heptane-Trans. Faraday Soc. vol. 40, p. 70 (1944). Partially reduced Cr_2O_3.

6-314. Aromatizing Catalysts—Bull. Acad. Sci. U.S.S.R.—Classe Sci. Chim. 1941, 177. Cr_2O_3-CoO, or Al_2O_3-Cr_2O_3-CoO.

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6-315. U. S. 2,289,916. July 14, 1942. CoO and Al_2O_3, reduce CoO to metal.

6-316. U. S. 2,290,033. July 14, 1942. 20% Cr & 80% Al oxides, coppted.

6-317. U. S. 2,301,044. Nov. 3, 1942. Aromatizing with H_2 in charge.

6-317a. U. S. 2,315,839. April 6, 1943. Alumina, chromia.

6-318. U. S. 2,317,683. April 27, 1943. Chromia, plus comp. of Groups IV, V, VI metals, on alumina.

6-319. U. S. 2,319,452. May 18, 1943. Gamma alumina supporting oxides of V, Cb, or Ta.

6-320. U. S. 2,321,006. June 8, 1943. Alumina, chromia & CuO.

6-321. U. S. 2,323,868. July 6, 1943. Cr & Al oxide gels, from Cr acetate and alkali aluminate solutions.

6-322. U. S. 2,324,073. July 13, 1943. $AlCl_3$, also Mo sulfide plus Cu metal, as cyclicizing catalyst.

6-323. U. S. 2,325,015. July 20, 1943. MoO_3 from NH_4 phosphomolybdate or alumino-molybdate, by H_2 reduction.

6-324. U. S. 2,331,292. Oct. 12, 1943. Hard alumina scale (Al_2O_3), plus Cr_2O_3.

6-325. U. S. 2,336,783 and 2,336,900. Dec. 14, 1943. Cr_2O_3, plus metallic Ni or ZrO_2.

6-326. U. S. 2,343,744. March 7, 1944. BF_3 in liquid HF. (Aromatization).

6-327. U. S. 2,344,318. March 14, 1944. Large % ThO_2, small % MgO & of oxide of metal, left, col., Group VI.

6-328. U. S. 2,349,045. June 16, 1944. Al_2O_3 plus 6% MoO_3-Aromatization.

6-329. U. S. 2,352,199 and 2,352,200. June 27, 1944. Al & Mo oxides; or SiO_2, Al_2O_3, & ZrO_2 or ThO_2.

6-330. Br. P. 552,216. March 29, 1943. Alloys of Fe, Cu, Ni, Co, Cr, or their mechanical mixtures.

6-331. Br. P. 552,551. April 14, 1943. Oxides of Cr, Hf, Th, Ce, rare earth metals.

6-332. Ger. P. 714,439. Nov. 6, 1941. H_3PO_4-impregnated pumice.

6-333. Ger. P. 736,839. May 20, 1943. Al_2O_3, Cr_2O_3, small amts. Mn, Th, Co, Ni compounds, one or more.

6-334. Russ. P. 58,762. Jan. 31, 1941. Cr & Co oxides on Cr_2O_3.

Miscellaneous Catalysis

7-335. Desulfurization of Gasoline with Ni Catalyst-Doklady Akad. Nauk-U.S.S.R., vol. 45, p. 25 (1944). Ni metal Catalyst-Hydrogenation.

7-336. U. S. 2,303,835. Dec. 1, 1942. Fe sulfate & NaCl on porous carrier. Sweetening.

7-337. U. S. 2,324,067. July 13, 1943. Al_2O_3 gel, V oxide-Desulfurization.

7-338. U. S. 2,325,115. July 27, 1944. Cr_2O_3 on alumina. Desulfurization.

7-339. Can. P. 413,254. June 15, 1943. Co molybdate or thiomolybdate, on porous gel of Al, Cr, Ti or Th oxides. Desulfurization.

7-340. Report, Gas Research Board, Pub. No. 8, Gas Jour., 1944, p. 623. Cu-Cr cat. with small amts. air, desulfurization of gas.

7-341. Synthesis of Aliphatic Acids, Chem. Zentr. 1943 II, p. 868. Mn Stearate-Na_2CO_3.

7-342. Catalytic Oxidation of Olefins & Cycloolefins, Chem. Zentr. 1943 I, p. 150. Osmium tetroxide.

7-343. U. S. 2,287,125. June 23, 1943. Mn butyrate plus O_2 Oxidation.

7-344. U. S. 2,330,934. Oct. 5, 1943. SiO_2 or Al_2O_3 gel, bauxite or clay. Oxidation to CS_2 with S.

7-345. Ger. P. 737,763. June 17, 1943. Co, Cu, Mn salt of unsaturated fatty acid. Oxidation.

7-346. Synthetic Motor Fuels. Chem. Zentr. 1943 I, p. 1237. Co, Ni, ThO_2-Fischer-Tropsch.

7-347. U. S. 2,339,927. Jan. 25, 1944. Co, Mn, infusorial earth. Fischer-Tropsch.

7-348. Can. P. 408,649. Oct. 17, 1944. Ni, Cu or Co treated with alkali hypohalite.

7-349. Ger. P. 728,766. Nov. 5, 1942. Treat Fischer-Tropsch catalyst with CO_2 to immunize to air.

7-350. Ger. P. 729,060. Nov. 12, 1942. Co and/or Ni ppted. on carriers with 1% Fe, Cu, Al or Ca.

7-351. Ger. P. 736,922. May 20, 1943. Co & CoO, on diatomaceous earth. Fischer-Tropsch.

7-352. Ger. P. 736,977. May 27, 1943. Fe Nitrate to FeO & Fe, on diatomaceous earth. Fischer-Tropsch.

7-353. Synthesis of Ketones, Hydrocarbons, Oel & Kohle, vol. 39, p. 523 (1943). $AlCl_3$ & $GaCl_3$-hydrocarbon complex. Friedel & Crafts.

7-354. Can. P. 420,739. June 13, 1944. CH_2O & $Ca(OH)_2$ exposed to ultraviolet light. General catalyst.

7-355. Ger. P. 738,090. July 1, 1943. Alloy of active and inactive metals, dissolve away inactive metal.

7-356. Ger. P. 736,527. May 13, 1943. Metals ppted. on SiO_2.

7-357. U. S. 2,331,521. Oct. 12, 1943. Silica-alumina in metal sheath.

7-358. U. S. 2,331,473. Oct. 12, 1943. NH_4 fluoride calcined on zeolitic synthetic siliceous material.

7-359. U. S. 2,292,561. Aug. 11, 1943. Alumina treated with a sulfate or sulfite, acidic ion removed. Hydration.

7-360. Ger. P. 710,127. July 24, 1941. Porous carrier with pores partially filled with organic film-forming material.

7-361. Ger. P. 720,576. April 9, 1942. Paste of SiO_2 & alumina in H_3PO_4, shaped and calcined.

7-362. U. S. 2,326,323. Aug. 10, 1944. Remove alkali ions from ppted. metal oxide by zeolite exchange, with permeable membrane.

7-363. U. S. 2,346,652. April 18, 1944. Halogenated aromatics added to charge to wash carbon from catalyst.

7-364. U. S. 2,322,554 and 2,322,555. June 22, 1943. MgO, to treat lubricating oils.

7-365. Can. P. 415,825. Oct. 12, 1943. Hydrated Mg Silicate, decolorization.

7-366. U. S. 2,299,220, 2,299,221, 2,299,222, and 2,299,223. Oct. 20, 1942. Organic compounds of Hg, Pb, or Bi, also chlorates, perchlorates, etc. Condense olefins & SO_2 to resins.

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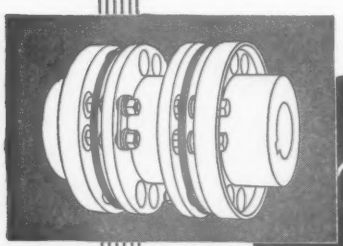

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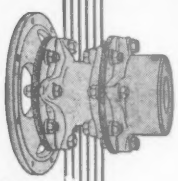

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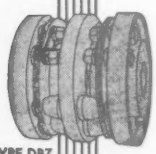

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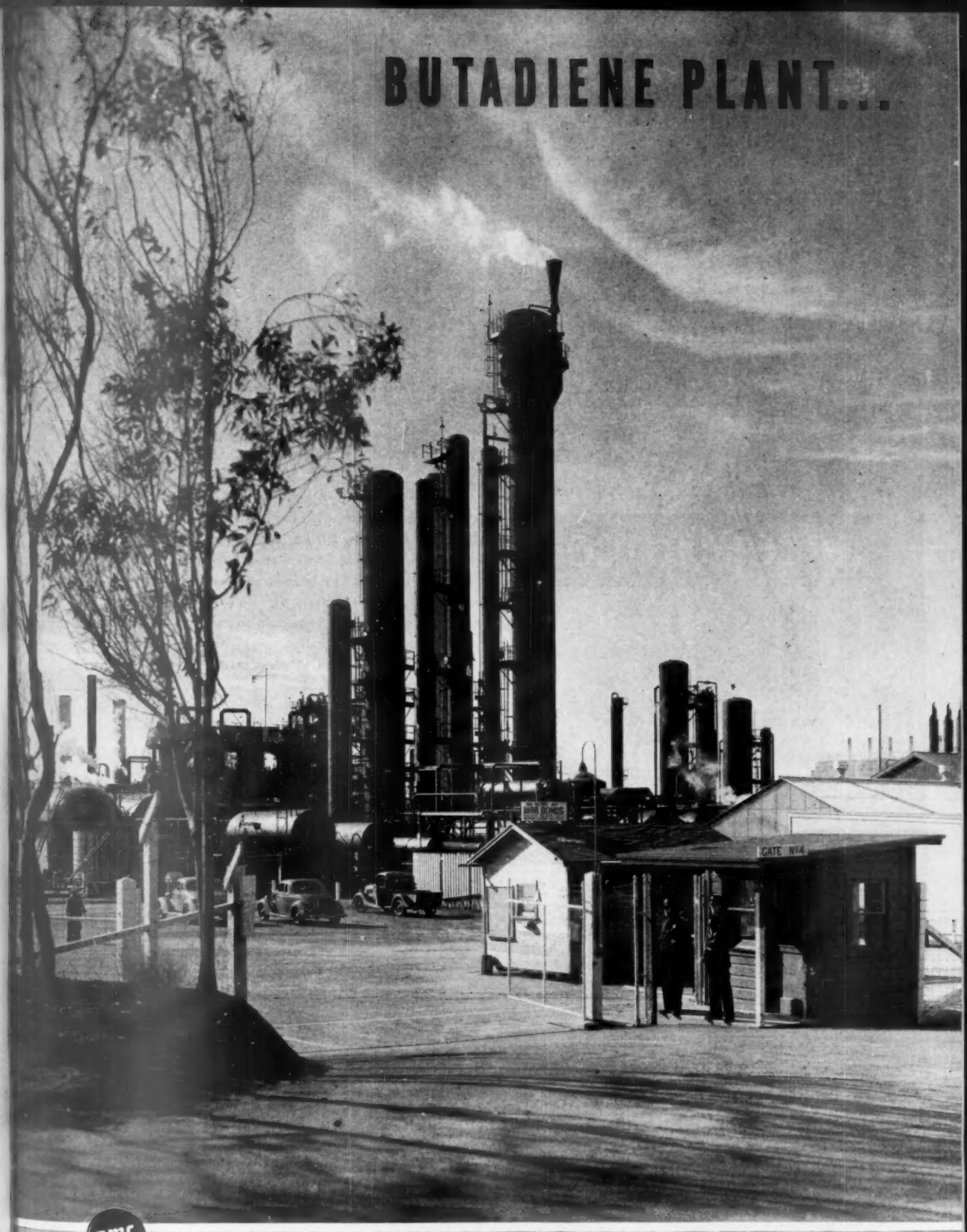

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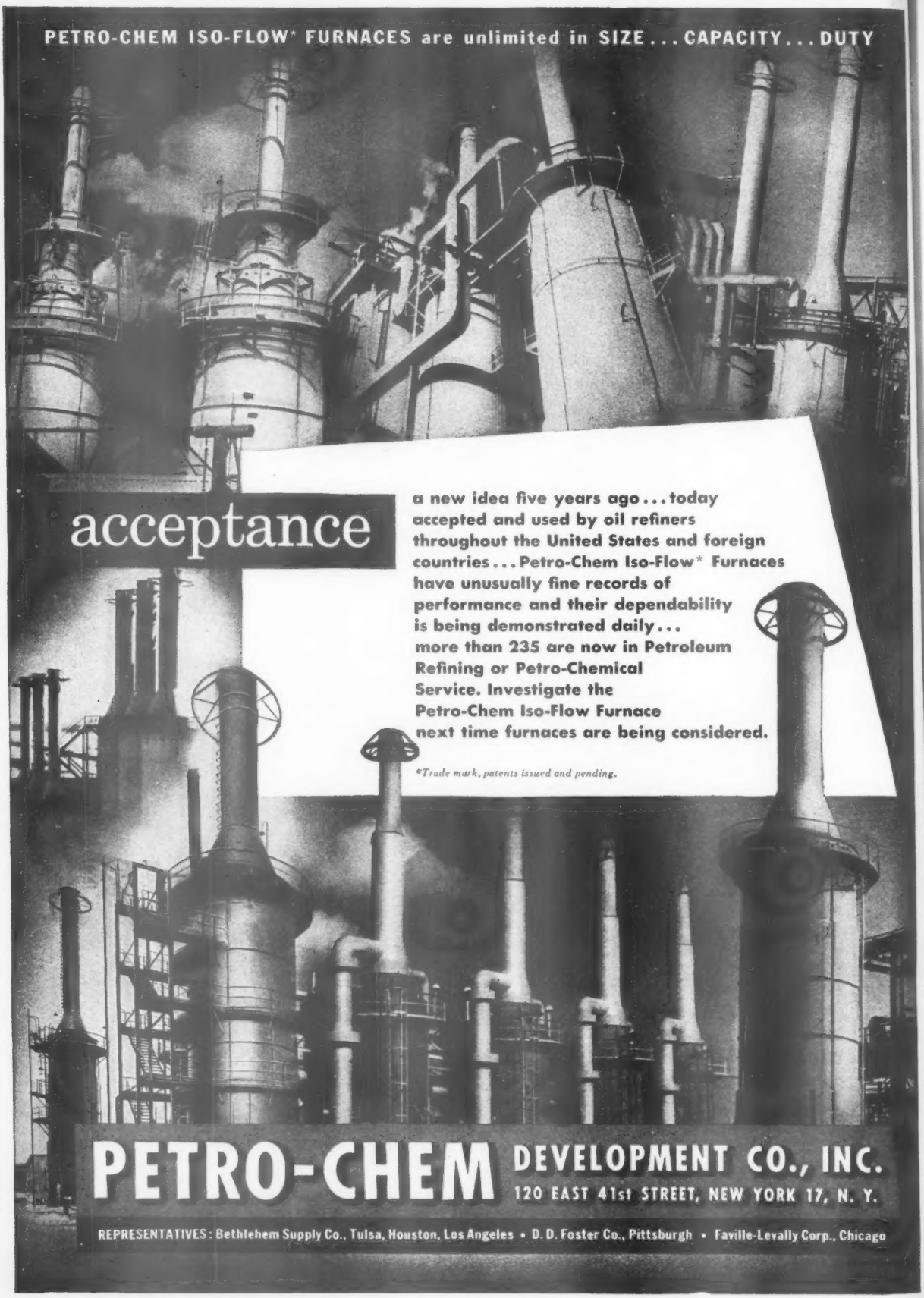
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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Lead Response—Cracked And Other Stocks

Last week L.B.W. asked for typical lead susceptibilities. Tabulations for high and low-sulfur straightrun gasolines and natural gasoline (Tables 1, 2, 3, and 4) were published last week.

Caution must again be voiced concerning the wide variations in lead susceptibility that occur and, it should be pointed out, that differences in clear octane number (boiling range or gravity) and amount of sulfur, account for most discrepancies. Thus, the accuracy of the average values shown with each table (particularly Tables 5, 7, and 8) could be improved if the high-sulfur stocks were eliminated (or grouped together) and in the case of Table 6 (desulfurized) better agreement would be obtained if the very high-gravity and very low-gravity stocks were eliminated.

Catalytic desulfurization.—The catalytic desulfurization processes known variously as Perco, Gray, Cobalt Molybdate, etc., yield gasolines (Table 6) of extremely high susceptibility to tetraethyl lead. Table 6 and the 55.9-octane gasoline of Table 3 (last week) indicate that catalytic desulfurization increases the octane number about as follows:

With 1 cc. TEL	4.8 units
With 2 cc. TEL	6.7 units
With 3 cc. TEL	7.5 units
With 4 cc. TEL	8.1 units
With 6 cc. TEL	8.9 units

These are significant increases particularly since they may permit the attainment of octane numbers of 80-87 by the use of tetraethyl lead with ordinary straightrun or natural-gasoline stocks.

Even cracked gasolines are improved by catalytic desulfurization by about the following octane units (71.6 clear octane):

None	3.4 units
With 1 cc. TEL	4.0 units
With 2 cc. TEL	4.1 units
With 3 cc. TEL	4.2 units
With 4 cc. TEL	4.3 units

However, such processes have not been practiced in the past because of the short life of the catalyst and because the urgency of improving octane number was so great.

Thermally cracked gasolines.—The susceptibility of these with respect to tetraethyl lead is relatively low. Comparison of 64.5 - octane - number cracked gasolines (Table 5) with 64-octane-number low-sulfur straightrun gasolines (Table 3, last week) shows that cracked gasolines are inferior to straightrun gasoline by about the following number of octane units:

With 1 cc. TEL	2.9 units
With 2 cc. TEL	4.4 units
With 3 cc. TEL	5.3 units
With 4 cc. TEL	5.9 units

TABLE 5—LEAD SUSCEPTIBILITY OF CRACKED GASOLINES

No.	Kind of stock or source—	A.P.I.	Per cent sulfur	Oct. No.	Increase in octane number (A.S.T.M., Motor or 1-C) 1 cc.	2 cc.	3 cc.	4 cc.	Ref.
1.	Panhandle	...	...	58.5	6.2	10.5	14.1	16.9	1
2.	Okla. City and W. Kansas	...	...	55.4	10.0	14.5	17.0	...	1
3.		57.4	0.084	59.5	7.0	10.5	13.5	...	1
4.	Kettleman Hills, Calif., acid tr. 4 samples	...	0.03	56.4	8.4	13.5	...	...	5
	Average	...	...	57.5	8.2	12.2	14.9	...	
	Smoothed	...	...	57.5	8.1	12.2	14.7	16.5	
5.	Kansas	...	...	62.8	7.8	12.3	15.3	17.8	1
6.	Okmulgee, Okla.	...	...	67.0	...	14.4	...	...	1
7.	Gray and Hutchinson Co., Texas	...	...	61.0	7.5	11.5	14.0	...	1
8.	Gray and Hutchinson Co., Texas	...	...	60.5	7.5	11.5	13.5	...	1
9.	Gray and Hutchinson Co., Texas	...	...	61.5	6.0	9.0	12.0	...	1
10.	Okla. City—Dubbs	...	...	62,5	6.0	9.0	12.0	...	1
11.	Okla. City and W. Kansas	...	...	63.7	7.3	10.8	12.3	...	1
12.	Okla. City and W. Kansas —Dubbs	...	...	65.7	7.3	10.3	12.3	...	1
13.		...	0.086	60.6	7.4	10.7	12.9	14.6	1
14.		...	0.072	62.6	8.0	11.2	13.4	14.6	1
15.		57.9	0.217	63.0	5.5	7.5	9.0	...	1
16.		59.3	0.164	63.0	5.5	8.5	11.0	...	1
17.		61.1	0.062	62.5	7.0	10.5	12.5	...	1
18.		51.3	0.352	64.5	5.0	7.5	9.0	...	1
19.		57.9	0.128	65.0	6.0	8.0	10.0	...	1
20.		59.3	0.067	66.0	6.0	9.5	11.5	...	1
21.		56.6	0.645	69.5	2.5	...	6.0	...	1
22.		60.1	0.305	67.5	4.0	...	8.0	...	1
23.		54.4	0.186	68.0	5.0	...	9.5	...	1
24.	California 402 e.p.	...	0.09	66.0	7.0	9.5	...	...	1
25.	California 390 e.p.	59.0	0.07	63.0	5.5	8.5	11.0	...	1
26.	Kettleman Hills, Calif., acid tr. 4 samples	...	0.13	63.0	6.5	9.5	...	...	5
27.	Kettleman Hills, Calif., acid tr. 4 samples	...	0.06	61.1	7.7	11.0	...	...	5
28.	So. Calif. acid treated	...	0.40	67.5	3.5	5.0	...	...	5
29.	So. Calif. acid treated	...	0.14	65.5	7.0	9.5	...	...	5
30.	So. Calif. acid treated	...	0.088	65.0	7.0	10.0	...	...	5
31.	Inglewood, Calif. acid treated 4 samples	...	1.11	67.0	3.0	4.8	...	...	5
32.	Inglewood, Calif. acid treated 4 samples	...	0.69	67.0	4.0	6.0	...	...	5
33.	Inglewood, Calif. acid treated 4 samples	...	0.24	65.0	6.0	8.6	...	...	5
34.	Elwood, Calif. acid treated	...	0.066	65.4	6.8	9.9	...	...	5
35.	Elwood, Calif. acid treated	...	0.025	62.9	9.2	12.8	...	...	5
36.	Elwood, Calif. acid treated	...	0.026	60.0	9.0	13.5	...	...	5
37.	Midway, Calif. acid treated	...	0.05	69.5	5.0	9.0	11.0	...	5
38.	Midway, Calif. acid treated	...	0.035	66.2	9.3	12.3	13.8	...	5
39.	West Texas	...	0.26	65.6	...	8.4	...	...	5
40.	West Texas acid treated	...	0.081	66.4	6.7	9.8	...	...	5
41.	West Texas acid treated	...	0.15	62.8	6.4	...	...	...	5
42.		...	...	65.7	4.3	...	8.8	...	3
	Average	...	...	64.5	6.3	9.7	11.3	...	
	Smoothed	...	...	64.5	6.5	9.5	11.3	12.6	
43.	California 435 e.p.	56.0	0.30	70.0	2.5	5.5	6.5	...	1
44.		62.5	0.282	70.5	4.5	6.0	7.5	...	1
45.		54.7	0.83	70.0	2.0		4.5	...	1
46.		57.8	0.137	72.0	2.0	3.5	...	...	1
47.		55.9	0.303	70.0	2.5	5.5	6.5	...	1
48.		59.8	0.135	70.0	5.0	7.0	9.0	...	1
49.		77.9	0.292	75.5	2.5	...	5.0	...	1
50.	Mixed Calif. acid treated	...	0.18	71.0	3.5	7.0	...	...	5
51.	Midway, Calif. acid treated	...	0.037	72.0	5.5	7.5	...	...	5
52.	Midway, Calif. acid treated	...	0.099	72.5	4.5	7.0	...	...	5
53.	Midway, Calif. acid treated	...	0.145	72.5	5.0	...	...	...	5
54.	Midway, Calif. acid treated	...	0.18	73.5	4.5	5.5	...	...	5
55.	Midway, Calif. acid treated	...	0.025	70.5	7.5	...	...	...	5
56.	San Joaquin, Calif.	...	...	73.0	...	...	6.0	...	8
57.	Santa Maria Valley, Calif.	...	...	70.0	...	...	5.0	...	8
58.		...	...	72.6	5.3	...	8.7	...	10
	Average	...	...	71.6	4.1	6.0	6.5	...	
	Smoothed	...	...	71.6	4.0	5.8	6.9	7.6	

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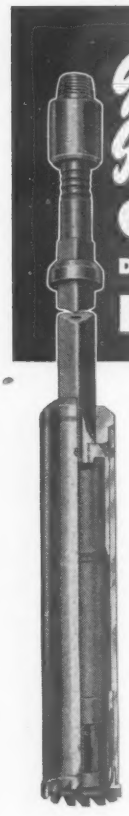

Get Loose Junk Quick with a COOPER DIE-FORMED BASKET

Get cones or other junk too large for ordinary baskets—and get it **all** in one grab! The special Cooper die-forming principle makes this the fastest, easiest-operating, most efficient tool of its kind. No need to circulate, rotate or make hole to pick up junk, though bridges can be drilled when encountered. The steel fingers scrape bottom as they close, catching and retaining both big and little objects. Does the job in less than 3 minutes on bottom.

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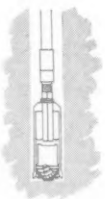
RUN TO BOTTOM

Attach the Cooper Die Formed Basket to the drill pipe and run it to bottom. No need to circulate, rotate or to make hole.

APPLY WEIGHT

Pressure shears the four pins which prevent fingers from closing prematurely, forces the fingers through the die inside the shoe.



STEEL FINGERS SCRAPE BOTTOM

The steel strips curve and interlock as they are driven through the die, forming a tight basket that picks up and retains both big and little junk.

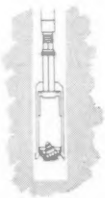


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TABLE 6—HEAD SUSCEPTIBILITY OF DESULFURIZED (CATALYTICALLY) GASOLINES

No.	Kind of stock or source—	Octane No. Raw*	Increase in A.S.T.M. octane number (Motor or 1-C) Clear	1 cc.	2 cc.	3 cc.	4 cc.	Ref.
1.	Borger natural	62.2	2.4	13.8	...	19.6	22.0	2
2.	Borger C_5-free natural	59.2	1.9	15.8	...	22.8	...	2
3.	Hobbs C_5-free natural	65.6	0	12.1	16.7	...	...	2
4.	18-lb. natural	71.0	2.6	11.7	16.4	...	...	3
5.	Pentane-free natural	54.7	1.6	15.7	...	25.7	...	3
6.	Pentane-free distillate	52.2	0.9	14.1	...	23.6	...	3
	Average	61.6	1.6	13.9	...	22.9	...	
	Smoothed	61.6	1.7	13.6	19.6	23.1	25.5	
7.	N. Mexico, Lt. straightrun	76.0	0	10.9	...	16.2	...	2
8.	Turner Valley, straightrun	58.7	1.9	13.8	19.3	...	...	3
9.	West Texas, straightrun	56.5	1.7	12.6	...	21.5	...	3
10.	440 e.p. naphtha	45.4	4.2	14.4	...	25.1	...	3
11.	...	53.7	3.6	15.0	...	25.2	...	3
12.	Straightrun and natural	59.5	2.4	14.7	...	22.3	...	3
13.	Typical straightrun	59.6	1.3	11.8	...	22.1	...	7
14.	Light straightrun	58.5	1.9	18.4	...	21.5	23.0	9
15.	Heavy straightrun	43.2	4.7	19.9	...	24.3	26.8	9
16.	Full-range straightrun	47.8	2.5	22.2	...	26.2	29.1	9
17a.	Straightrun using Earth A	58.4	2.3	13.8	...	22.7	...	9
17b.	Straightrun using Earth B	58.4	1.9	14.3	...	23.4	...	9
17c.	Straightrun using Earth C	58.4	2.0	14.6	...	22.2	...	9
17d.	Straightrun using Earth D	58.4	2.2	14.3	...	22.5	...	9
17e.	Straightrun using bauxite A	58.4	2.0	14.9	...	22.6	...	9
17f.	Straightrun using bauxite B	58.4	0.6	12.8	...	21.5	...	9
18.	N. Mex. St. Run (caustic washed)	60.6	4.5	13.5	...	21.4	...	10
19.	Mid-Continent	54.3	...	14.6	...	24.6	...	10
20.	...	36.8	...	18.8	...	31.6	...	10
21.	...	58.7	...	15.1	...	23.5	...	10
22.	...	71.0	...	11.3	15.8	...	...	10
23.	...	61.5	...	12.9	...	18.5	...	10
24.	...	58.5	...	14.3	...	22.9	...	10
25.	...	40.0	...	19.8	...	34.7	...	10
26.	...	52.7	...	14.1	...	25.0	...	10
	Average	54.5	2.5	15.1	...	24.9	...	
	Smoothed	54.5	2.6	14.9	21.3	25.2	27.9	
27.	Cracked gasoline (Clay 24 hr. old)	65.7	3.4	8.2	...	14.1	...	3
28.	Cracked gasoline (Clay 48 hr. old)	65.7	2.6	10.1	...	12.7	...	3
29.	Cracked gasoline	72.6	...	8.9	...	11.5	...	10
30.	Thermal Polymer	72.0	2.5	8.1	...	10.8	...	3
31.	San Joaquin Calif. P.D.	73.0	...	...	...	11.0	...	8
32.	San Maria Calif. P.D.	70.0	...	...	...	10.0	...	8
	Average	69.9	2.8	8.8	...	11.7	...	
	Smoothed	69.9	3.4	8.3	10.4	11.7	12.6	

*Raw stock, not desulfurized.

TABLE 7—LEAD SUSCEPTIBILITY OF CATALYTIC CRACKED GASOLINE

No.	Stock or source—	A.P.I.	Per cent sulfur	Oct. No.	Increase in octane number (A.S.T.M., Motor or 1-C) 1 cc.	2 cc.	3 cc.	4 cc.	Ref.
1.	Houdry avia. (raw)	63.0	0.02	77.5	6.5	9.1	11.0	12.3	11
2.	Houdry motor	53.0	0.03	77.0	5.5	7.5	9.0	...	11
3.	Houdry avia. (acid treated)	63.0	0.01	78.0	7.0	10.2	12.7	...	11
4.	Houdry avia. (acid treated)	62.8	0.01	77.7	6.9	9.9	12.3	...	11
5.	Houdry avia. (v.p. treated)	62.2	0.02	79.2	6.8	9.4	11.4	...	11
6.	Houdry avia. (l.p. treated)	62.5	0.01	77.4	7.3	9.8	11.4	...	11
7.	Houdry (catalytic treated)	60.6	0.02	78.0	4.7	6.1	7.1	...	11
8.	Houdry (catalytic treated)	59.1	0.01	77.8	4.4	6.5	7.5	...	11
9.	Houdry (catalytic treated)	58.4	0.04	66.5	7.9	12.4	14.4	...	11
10.	Houdry W. Tex. (Cat. treat.)	58.5	0.06	74.0	5.0	7.2	8.4	...	11
11.	Houdry W. Tex. (Cat. treat.)	56.5	0.08	77.0	4.1	5.3	6.4	...	11
12.	Houdry catalytic reforming	60.1	0.01	77.6	...	...	12.9	...	6
13.	Houdry catalytic reforming	64.0	0.01	77.7	...	...	14.8	...	6
14.	Houdry catalytic reforming	57.8	0.01	76.5	7.0	...	12.0	...	6
15.	Houdry catalytic reforming	57.5	0.01	61.8	10.6	...	18.1	...	6
16.	Houdry catalytic reforming	63.0	0.01	63.5	9.5	...	16.5	...	6
17.	Houdry E. Texas raw	63.4	...	79.9	5.8	...	9.5	...	12
18.	Houdry W. Texas raw	64.8	...	79.1	3.2	...	6.3	...	12
19.	Houdry Coastal raw	60.4	0.01	80.5	...	...	9.7	...	12
20.	Houdry Okla. City raw	61.0	...	77.4	7.0	...	10.1	...	12
21.	Houdry Mid-Continent raw	62.3	0.01	78.2	...	...	10.4	...	12
22.	Houdry Mid-Continent raw	...	0.03	79.1	3.2	...	6.5	...	12
23.	Houdry Mirando Tex. raw	52.8	...	80.9	4.1	...	7.1	...	12
24.	Houdry from E. Tex. gas oil	...	...	80.9	5.3	...	9.2	...	1
25.	Houdry mixed stocks	...	...	78.0	5.5	...	9.5	...	1
26.	Houdry Calif. high sulfur	...	...	78.0	4.7	...	7.4	...	1
27.	Houdry from Venez. gas oil	...	...	79.4	...	...	9.9	...	1
28.	Houdry from Reduced Ill. crude	...	...	89.3	3.6	...	5.7	...	1
29.	Houdry from Mirando Tex.	...	...	80.7	3.8	...	8.5	...	1
30.	Houdry from East Texas	...	...	79.8	3.1	...	5.1	...	1
	Average	...	...	75.8	5.7	...	10.0	...	
	Smoothed	...	...	75.8	5.9	8.5	9.9	10.9	
31.	Thermofor Avia.	...	0.05	77-80	...	...	15.0	17.0	13
32.	Cycloversion	59.7	0.05	76.3	2.7	...	5.2	...	14
33.	Cycloversion Reforming	62.8	0.005	61.5	9.5	...	18.1	...	14
34.	Cycloversion Reforming	59.0	0.008	55.3	13.5	...	23.1	...	14
35.	Cycloversion Reforming	55.1	0.008	68.3	9.3	...	14.8	...	14
36.	Cycloversion	59.4	...	76.3	...	...	4.8	...	15

TABLE 8—HEAD SUSCEPTIBILITY OF AROMATIC STOCKS

No.	Kind of stock or source—	A.P.I.	Per cent sulfur	Oct. No.	Increase in octane number (A.S.T.M., Motor or 1-C) 1 cc.	2 cc.	Ref.
1.	Gasoline from Coaligna crude	47.9	0.008	71.9	10.8	12.9	5
2.	Gasoline from Coaligna crude	41.2	0.048	71.2	6.8	9.9	5
3.	SO_2 extract from Kettleman, Cal.	43.9	0.03	76.1	4.8	7.5	5
4.	SO_2 extract from Kettleman, Cal.	47.1	0.023	69.7	8.3	11.2	5
5.	SO_2 extract from Southern Calif.	41.9	0.43	75.9	4.5	6.5	5
6.	SO_2 extract from Southern Calif.	40.1	0.495	76.9	3.7	...	5
7.	SO_2 extract from San Joaquin, Calif.	37.4	0.32	74.4	4.0	4.9	5
8.	SO_2 extract from San Joaquin, Calif.	35.6	0.41	78.6	2.7	3.5	5
9.	SO_2 extract from San Joaquin, Calif.	35.4	0.47	79.1	2.7	3.9	5
10.	SO_2 extract from Bahrein	45.1	0.054	71.1	6.9	...	5
11.	SO_2 extract from Bahrein	52.4	0.034	59.7	11.2	14.9	5
12.	SO_2 extract from Bahrein	50.3	0.024	63.8	9.0	13.2	5
13.	SO_2 extract from Bahrein	38.0	0 15	72.6	5.6	...	5
	Average	...	...	72.6	6.2	8.8	
	Smoothed	...	...	72.6	6.2	9.0	

Sulfur does not appear to be as detrimental to cracked gasolines as it is to straightrun gasolines. Some improvement occurs by its removal (see Items 26-33, and 51-55, Table 5) but the effect is not great. Cracked gasolines of low octane number (lightly cracked) have lead susceptibilities that are only slightly inferior to those of straightrun products.

Catalytic and aromatic stocks.— These materials (Tables 7 and 8) respond to tetraethyl lead to a greater degree than thermally cracked materials but they are inferior to comparable straightrun stocks.

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K. O. Stowell, formerly operating superintendent of Great Southern Corp.'s aviation-gasoline plant in Corpus Christi, has been made superintendent of Chalmette Petroleum Corp.'s refinery at Chalmette, La. Stowell previously had served Humble Oil & Refining Co. as technical supervisor, then refining department process engineer, and later operating superintendent of the butadiene plant, at Ingleside, Tex. **J. A. Kearney,** formerly traffic manager at Chalmette, has been promoted to chief clerk.

Addison Young, Phillips Petroleum Co., has been elected president of Midland (Tex.) Geological Society for the coming year; **W. Henry Conkling,** Sun Oil Co., vice president; **Mary Louise Rhodes,** Standard Oil Co. of Texas, secretary-treasurer.

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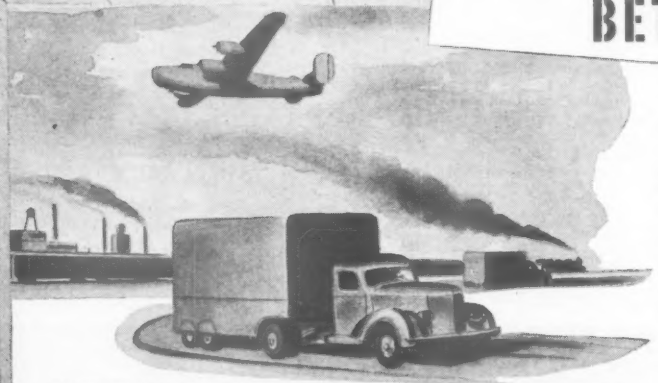

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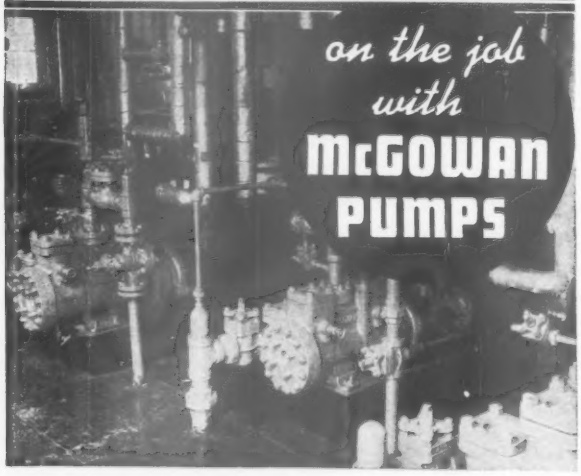

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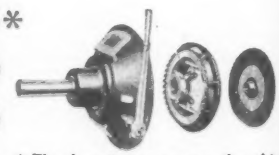

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Geology of Acidizing

This is the first of a series of discussions on acidizing wells, which represent the assistance of several treating experts and engineers. The remaining parts of the series will present the chemistry, technique, and results of acidizing; dissolving mud sheaths; and distinguishing spent acid from formation waters.

OIL-PRODUCTIVE formations which are composed chiefly of limestone or dolomite may have a wide range in permeability and porosity. In many cases the distribution of the porosity or voids is much more erratic than in oil-bearing sandstones, and the character of the porosity also can be different. In many pools the limestones or dolomites, as exposed to the well bore, in large part or altogether are quite tight and of low flow capacity. Consequently, they may be acid treated to increase the size of the existing flow spaces and to open up new channels in the formation, thus increasing the productivity of the well.

Acidizing itself is not strictly a new enterprise for records show that injection of hydrochloric acid was used at Lima, Ohio, as early as 1894. The process was used but little, however, until the early 1930's when better procedures and improved techniques in getting the acid into the oil-productive sections of the formation, brought forth the real start of the present-day processes. Now, acidizing work is done in practically all oil fields where the reservoir rock is limestone or dolomite, and it has proven to be a very important completion procedure.

There are a number of chemical and physical factors involved in the making of proper acid treatments, but careful attention also must be devoted to the starting phases of the work; that is, to the geological aspects and lithological character of the formations themselves. Oil-productive rocks which are treated with hydrochloric acid are limestones, composed of calcium carbonate ($CaCO_3$), dolomites which are mixtures of calcium and magnesium carbonates

$$CaMg(CO_3)_2$$

and dolomitic limestones.

In treating, hydrochloric acid dissolves the limestone or dolomite. In dissolving, if the rocks are of uniform texture or homogeneous in pore arrangement, the dissolution will simply enlarge the well bore and increase the pore sizes in the rock immediately surrounding. However, in limestones or dolomites which have erratic texture, or which include fissures and cracks as the major flow channels, the dissolving action of the acid will be concentrated in these crevices and the principal effect will be in enlarging them. In these cases, also, the acid will move farther back into the formation and the productivity or flow capacity of the well usually will be increased many fold, even though the actual radius of the well bore is increased but little.

Geologists classify the kinds of porosity in calcareous rocks into

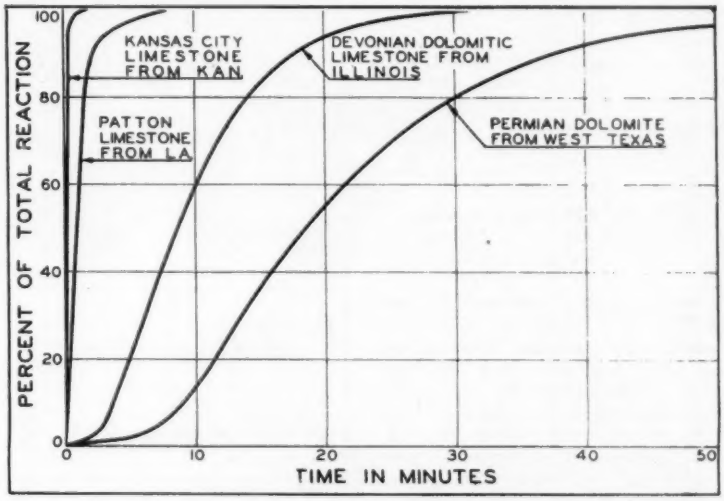

Fig. 2

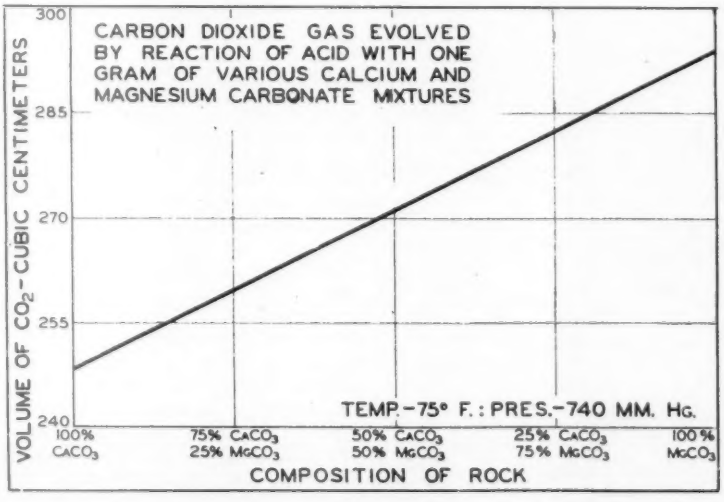
CARBON DIOXIDE GAS EVOLVED BY REACTION OF ACID WITH ONE GRAM OF VARIOUS CALCIUM AND MAGNESIUM CARBONATE MIXTURES
VOLUME OF CO_2 - CUBIC CENTIMETERS
300
285
270
255
240
TEMP. - 75° F.: PRES. - 740 MM. Hg.
100% $CaCO_3$
75% $CaCO_3$ 25% $MgCO_3$
50% $CaCO_3$ 50% $MgCO_3$
25% $CaCO_3$ 75% $MgCO_3$
100% $MgCO_3$
COMPOSITION OF ROCK

Fig. 1

two divisions: (1) Original porosity, and (2) induced or secondary porosity. Original pore spaces are those formed between limestone granules and particles during deposition on the sea bottom. Secondary porosity covers the class of voids which were formed after deposition, cracks, and open joints formed by earth movement, solution channels and crevices formed by percolating ground waters, etc.

The geological aspect of calcareous porosity are most interesting, and specific knowledge of the over-all makeup of the rocks to be acid treated is very helpful. Microscopic examination of the drill cuttings, or cores from the calcareous formation to be acidized, will usually lead to a better understanding of the changes being accomplished.

Seldom are chemically pure carbonates found as oil-productive formations. Generally they will contain a substantial amount of sand grains, shale, anhydrite, and gypsum, together with smaller quantities of other impurities which are mostly insoluble and frequently of extremely fine size.

In many cases the rocks are dolomitic, containing from a few per cent to 30 per cent of $MgCO_3$. When pure $CaCO_3$ is dissolved by HCl, the products are CO_2 (gas), H_2O, and $CaCl_2$. A 1-gram sample of the $CaCO_3$ will liberate 248 ml. of CO_2. If 1 gram of $MgCO_3$ is treated with HCl, the products are $MgCl_2$, H_2, and 293 ml. of CO_2. Fig. 1 shows the volume of carbon dioxide evolved by reaction of HCl with 1 gram of various calcium and magnesium carbonate mixtures at 75° F. and 740 mm.

Another distinction between limestone and dolomite acid treating is that purer limestones react rapidly, while those more dolomitic or containing more magnesium carbonate react more slowly. Data illustrating this feature are shown in Fig. 2, which is based on conditions of 75° F. and atmospheric pressure.

Less heat of reaction is generated from acidizing limestones than dolomites, as shown from the following equations:

$$(A)\ 2HCl + CaCO_3 = CaCl_2 + H_2O$$
$$73 \quad 100 \quad 111 \quad 18$$
$$+ CO_2 + 8{,}257\ \text{B.t.u.}$$
$$44$$

$$(B)\ 4HCl + CaMg(CO_3)_2 = CaCl_2$$
$$146 \quad 184.3 \quad 111$$
$$+ MgCl_2 + 2H_2O + 2CO_2$$
$$95.3 \quad 36 \quad 88$$
$$+ 36{,}388\ \text{B.t.u.}$$

The figures given below the equations can be expressed in pounds of the compounds involved. On a 1-lb. basis of limestone dissolved, there are 8,257/100 or 82.57 B.t.u. of heat generated. In the case of 1 lb. of dolomite, there are 36,388/184.3 or 197.5 B.t.u. generated.

Other Thermochemical Data

Equations (A) and (B) above prevail only when the reactions are at low pressures, with the CO_2 given off as a gas. When the reactions are at high pressure, as most well treating operations are, the CO_2 remains dissolved in the spent acid and the solution of the CO_2 in the spent acid liberates an additional quantity of heat. Accordingly, for (A), in the case of 1 lb. of limestone, the B.t.u. become 16,816 and in (B) for 1 lb. of dolomite, 53,507.

	LIMESTONE		DOLOMITE	
	CO_2 LIBERATED AS GAS	CO_2 DISSOLVED IN SPENT ACID	CO_2 LIBERATED AS GAS	CO_2 DISSOLVED IN SPENT ACID
BTU PER POUND OF ROCK	82.6	168.2	197.5	290.3
BTU PER GALLON OF 15% HCL	151.8	309.1	334.4	491.8
TEMPERATURE RISE IN SPENT ACID °F.	20.1	41.0	44.6	65.5
TEMPERATURE RISE °F. IN SPENT ACID AND SURROUNDING ROCK ASSUMING 15% POROSITY	4.4	9.0	9.3	13.6

Table 1

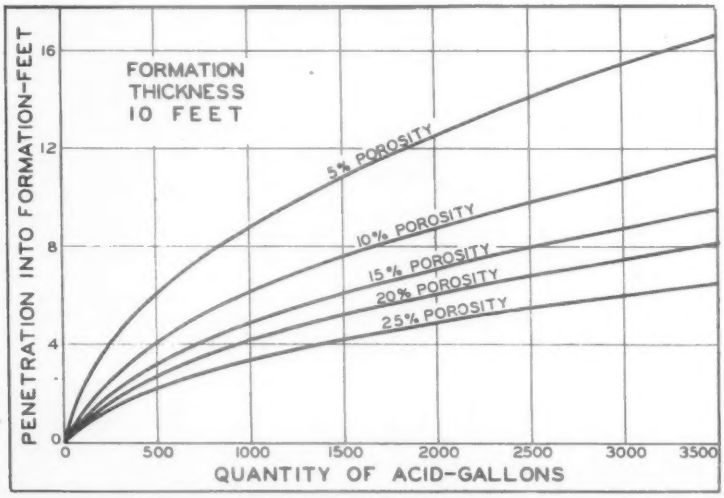

Fig. 3

Table 1 are listed the thermochemical data involved in the reactions of HCl with limestone and dolomite. The third line indicates the temperature rise when all the heat of reaction is used in the spent acid. In Line 4 is shown the temperature rise in both the spent acid and the surrounding rock—a representation on the general order that results in actual well treatments.

Again on the geological side in acidizing work, questions often arise as to how far a given volume of acid (or any liquid) will penetrate in a uniform circular arrangement from the well bore. Fig. 3 gives a number of curves from which answer to such questions quickly may be obtained.

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34	...	...	50.5	54.2	57.0	59.4	61.3	63.0	65.7	68.1
36	...	...	52.1	55.5	58.2	60.6	62.4	64.1	66.8	69.0
38	...	50.3	53.8	56.9	59.6	61.8	63.5	65.2	67.7	69.8
40	...	51.7	55.3	58.3	60.8	62.9	64.5	66.2	68.4	70.6
42	...	53.3	56.8	59.7	62.1	64.1	65.7	67.2	69.6	71.5
44	51.1	55.1	58.6	61.4	63.6	65.6	67.1	68.6	70.8	72.6
46	52.8 (51.0)	56.9 (54.2)	60.2 (56.8)	63.0 (59.1)	65.1 (60.8)	67.1 (62.4)	68.5 (63.5)	69.8 (64.7)	72.0 (66.4)	73.7 (67.9)
48	54.6 (53.2)	58.7 (56.5)	62.0 (58.9)	64.6 (61.0)	66.7 (62.7)	68.5 (64.2)	70.0 (65.2)	71.2 (66.2)	73.2 (67.8)	74.9 (69.1)
50	56.4 (55.1)	60.4 (58.2)	63.6 (60.5)	66.1 (62.5)	68.1 (64.1)	67.9 (65.4)	71.2 (66.5)	72.4 (67.4)	74.4 (68.9)	76.1 (70.1)
52	58.3 (57.0)	62.3 (60.0)	65.3 (62.3)	67.8 (64.2)	69.7 (65.7)	71.3 (67.0)	72.5 (68.0)	73.7 (68.9)	75.6 (70.3)	77.3 (71.5)
54	60.2 (58.9)	64.1 (61.8)	67.1 (64.1)	69.5 (65.9)	71.4 (67.3)	72.9 (68.5)	74.1 (69.4)	75.2 (70.3)	77.0 (71.6)	78.5 (72.8)
56	62.1 (60.8)	66.0 (63.6)	69.0 (65.8)	71.1 (67.5)	72.9 (68.9)	74.3 (70.0)	75.6 (70.9)	76.6 (71.6)	78.3 (73.0)	79.8 (74.0)
58	64.0 (62.6)	67.8 (65.5)	70.7 (67.6)	72.8 (69.2)	74.5 (70.5)	75.9 (71.5)	77.0 (72.4)	78.0 (73.1)	79.6 (74.4)	81.0 (75.4)
60	65.9 (64.5)	69.6 (67.3)	72.4 (69.4)	74.4 (70.9)	76.1 (72.1)	77.4 (73.0)	78.4 (73.8)	79.4 (74.6)	81.0 (75.7)	82.3 (76.7)
62	67.8 (66.4)	71.4 (69.1)	74.2 (71.1)	76.1 (72.5)	77.6 (73.7)	78.9 (74.6)	80.0 (75.4)	80.9 (76.1)	82.4 (77.2)	83.6 (78.1)
64	69.7 (68.3)	73.3 (71.0)	76.0 (72.9)	77.8 (74.2)	79.3 (75.4)	80.5 (76.3)	81.6 (77.0)	82.4 (77.6)	83.8 (78.7)	84.9 (79.6)
66	71.5 (70.2)	75.1 (72.7)	77.7 (74.6)	79.5 (75.8)	80.9 (76.9)	82.0 (77.7)	83.0 (78.4)	83.8 (79.0)	85.1 (80.0)	86.2 (80.9)
68	73.4 (72.0)	76.9 (74.6)	79.4 (76.4)	81.2 (77.6)	82.5 (78.6)	83.6 (79.4)	84.5 (80.0)	85.3 (80.6)	86.5 (81.6)	87.6 (82.4)
70	75.3 (73.9)	78.6 (76.3)	81.1 (78.1)	82.7 (79.3)	84.0 (80.2)	85.1 (81.0)	85.8 (81.6)	86.6 (82.1)	87.8 (83.0)	88.9 (83.8)
72	77.2 (75.8)	80.5 (78.1)	82.9 (79.8)	84.4 (80.9)	85.6 (81.8)	86.6 (82.5)	87.4 (83.0)	88.0 (83.6)	89.2 (84.4)	90.2 (85.1)
74	79.1	82.3	84.6	86.0	87.2	88.1	88.9	89.5	90.6	91.5
76	80.9	84.0	86.2	87.5	88.6	89.5	90.2	90.8	91.8	92.7

*Data for this table taken from Questions on Technology, October 6, 1945, p. 117, The Oil and Gas Journal.

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by Kenneth B. Barnes

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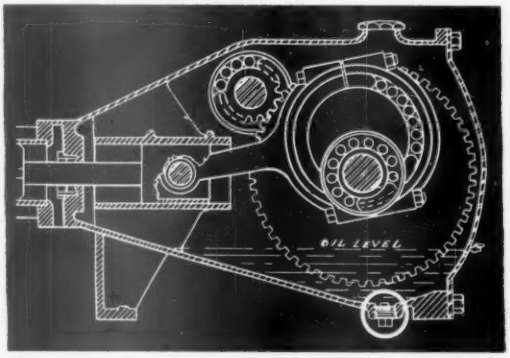

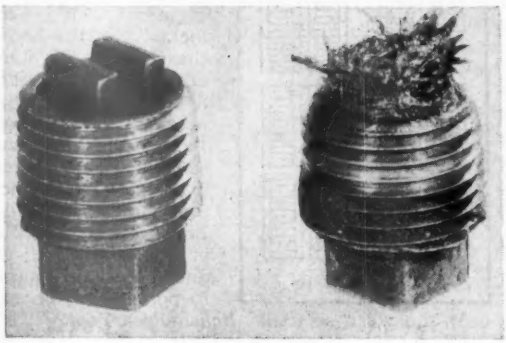

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of 140 to 160. Pour points vary from —30° to —80° F. Flash points range from 300° F. up. Densities are approximately that of water. Carbon residue values are less than 0.01 per cent, regardless of viscosity. Wax free. Sludge and varnish formations in engines reported practically eliminated. Tested for several years in vehicles covering more than 1.5 million road miles. Large quantities used in military equipment. The compounds are manufactured in both water soluble and water insoluble types, the latter for internal combustion engines. The many applications include refrigerating and other machinery operated under low temperature conditions or where a nonsludge oil is required. Greases prepared from these lubricants have unusual high and low-temperature properties. *Carbide & Carbon Chemicals Corp.*

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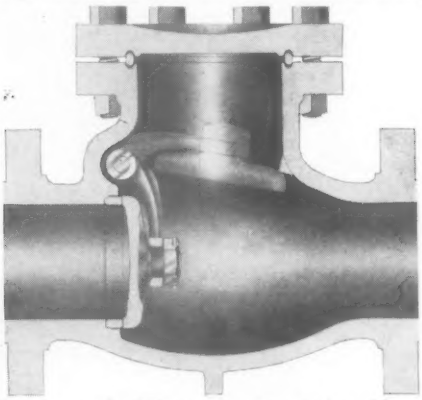

of disk in neck. Hinge arrangement guides disk to fit snug against the seat, effecting complete shutoff. Will not stand open. Cast steel, with bronze, stainless steel or stellite-faced trim. *Sollberger Engineering Co.*

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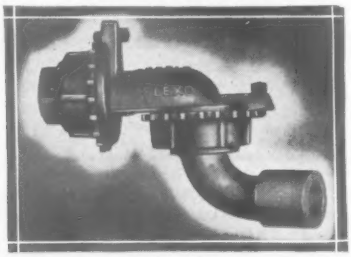

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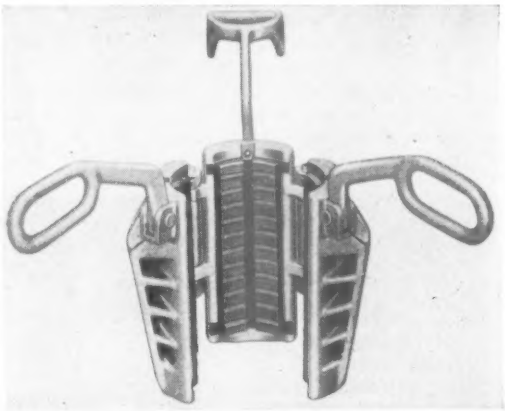
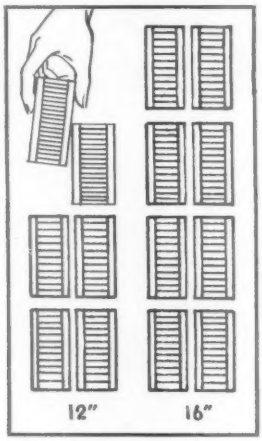
IT'S NEW CHECK IT

(7) "DU" UNITIZED ROTARY SLIPS reduce maintenance and spare parts inventory to a mini-

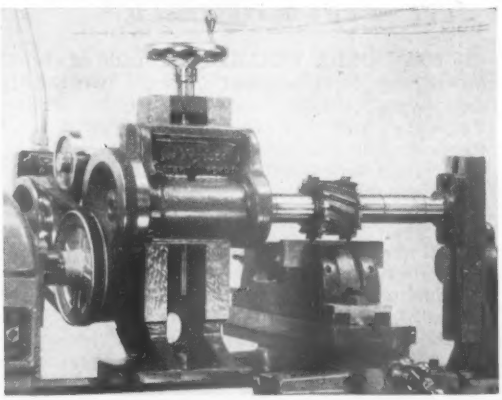




mum. Designed so that the same body fits a wide range of pipe sizes by simply changing the liners. New liners are now made in short 4-in. segments which are locked into the bodies the same as the longer lengths. Now it is not necessary for an operator to stock both 12 and 16-in. liners, as three 4-in. segments make up a 12-in. liner, four make up a 16-in. liner. Lengthens life of the slips and reduces cost by making it possible to change only the worn sections. *Baash-Ross Tool Co.*

IT'S NEW CHECK IT

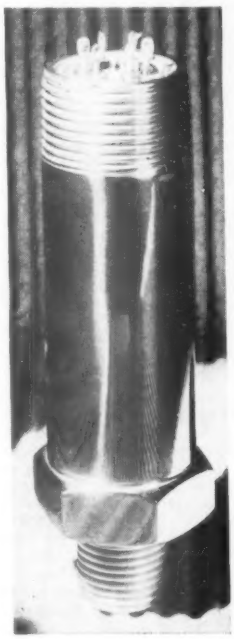
(8) MILLER ATTACHMENT quickly converts a lathe for same precision work as a costly mill-



ing machine. Operation is identical with standard milling machines, except the spindle is moved into position to engage the work, rather than the work lifting to engage the spindle. Also increases the swing of a small lathe almost double. Swing for an 11-in. lathe can be increased to 19½ in. Costs only a fraction of a standard miller. Performs gear cutting, slitting, gang-milling, cutting T slots and keyways, etc. *Globe Products Manufacturing Co.*

IT'S NEW CHECK IT

(9) SR-4 PRESSURE SENSITIVE ELEMENT is an entirely new item in instrumentation. It converts gas or liquid pressure to electrical energy. Essentially an electronic device, the measurements can be transmitted long distances for direct reading, recording or control. Transmission even by radio is feasible. Based on principle of the SR-4 strain gage, heart of the device is a very fine filament wire bonded to a hollow metal core against which is exerted the pressure to be measured. As the pressure increases this filament stretches, changing its diameter and causing measurable changes in the electrical resistance. This change in resistance varies amount of current flowing through the filament circuit and, when amplified, shows up on the dial or is used to actuate a control system. Filament is sensitive to a "stretch" of the metal core of only one-millionth of an inch. Hermetically sealed, an ingenious built-in compensator cancels out the effect of any extraneous force such as temperature. *Baldwin Locomotive Works.*

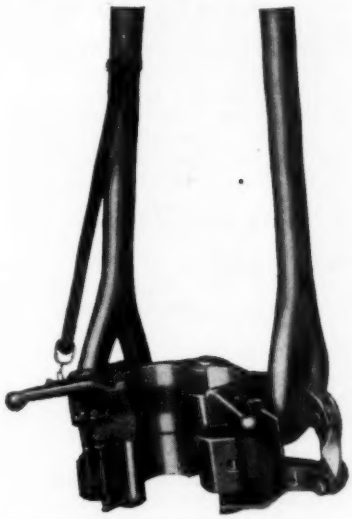


IT'S NEW CHECK IT

(10) "DUNKIRK EZ" is a free-machining tool steel described as being "outside the usual tool steel specifications, with extraordinary possibilities in the fields of cold work applications and tool steel machined parts, such as dies, gages, forming rolls, bushings, liners, and bodies for multiple-edge tipped tools." Reported to give from 25 to 200 per cent faster machinability. Will harden to about 65 Rockwell C when oil quenched from 1,450-1,550° F.; may be tempered up to 500° F. without softening under 60 Rockwell C; is rather deep-hardening, which gives proper hardness even in large sections. *Allegheny Ludlum Steel Corp.*

IT'S NEW CHECK IT

(11) NEW MGG ELEVATOR will handle 20,000 ft. strings of 4½-in. upset drill pipe. Has a capacity of 200 tons with safety factor of 4 to 1. Basically similar to the type "G" elevator, which is recorded to have never dropped a string of pipe, the "MGG" is heavied up throughout. To minimize wedging action in handling long heavy strings of externally upset drill pipe, the seating taper is within the body rather than on the top bore. The heavy stirrup-type center latch, that cannot accidentally be opened, fits over a heavy lug on the door. The latch lock must be moved 30° before releasing, then continued movement completes the opening. *Byron Jackson Co.*



IT'S NEW CHECK IT

TRADE LITERATURE

(12) PETROLEUM REFINING PROCESSES Brochure contains data on a number of war-developed processes and combinations of processes supplemented by flow diagrams and photographs. Designed to aid refiners who must install modern facilities and refiners who must develop refining operations with war-time facilities. *The Lummus Co.*

IT'S NEW CHECK IT

(13) DIESEL TRACTOR. Thirty-two-page color catalog thoroughly describes diesel tractor. All features freely illustrated of both tractor and diesel engine which motivates it. Contains specifications and lists a complete line of matched equipment. *Caterpillar Tractor Co.*

IT'S NEW CHECK IT

(14) OIL-FIELD CHAIN BELTS. New bulletin contains 12 pages of descriptive matter, specifications, prices and illustrations. Also gives price lists, strengths and dimensions. One section of bulletin devoted to tips on care of chain and another section devoted to care of Rex oil field pumps. *Chain Belt Co.*

IT'S NEW CHECK IT

(15) SYNTHETIC RUBBERS FOR INDUSTRIAL USE. Twenty-page illustrated bulletin describes special purpose synthetic rubbers and their industrial use. Bulletin directed to engineers, designers and production men, purchasing agents and executives. Discusses manufacturing processes, characteristics of the crude polymers, properties and applications. Tables give complete range of properties, physical properties, effects of oil and heat aging, etc. *Hycar Chemical Co.*

IT'S NEW ✓ CHECK IT

(16) STEAM JET EJECTORS. Six-page fold-out bulletin lists applications, contains cross-sectional drawing and engineering data and table of ejector capacities. Also has table of air-vapor mixture ratings, curve showing mixture ratios for saturated air and complete table of sizes, dimensions and weights. *Ross Heater & Mfg. Co.*

IT'S NEW ✓ CHECK IT

(17) ROTARY CASING SCRAPER. Sixteen-page booklet describes advantages of scraper, ease with which it works, safety and simplicity of running it. Illustrated to show operation of scraper, obstructions inside pipe, construction. Also has specifications guide and instructions for ordering. *Baker Oil Tools, Inc.*

IT'S NEW ✓ CHECK IT

(18) PORTABLE HYDRAULIC PRESS. Unusual press completely described in new catalog which gives specifications, capacities and other pertinent information. Versatility of press is shown by illustrations which also show adaptability to heavy-duty pulling or pressing problems. Interesting to those responsible for equipment maintenance and servicing. *Rodgers Hydraulic, Inc.*

IT'S NEW ✓ CHECK IT

(19) WELDING ACCESORIES. Price list and catalog of gas welding and cutting supplies and accessories. Sixteen pages, contains illustrations, descriptions, engineering data and current prices. Information concerning properties and uses accompany each article listed. *Air Reduction Sales Co.*

IT'S NEW ✓ CHECK IT

(20) RESISTANCE OF NICKEL and its alloys to corrosion by caustic alkalies. Twenty-page booklet assembles and discusses results of recent tests on metal corrosion by caustic soda and other alkali solutions. *International Nickel Co., Inc.*

IT'S NEW ✓ CHECK IT

(21) GENERATING PLANTS: HOISTS: AND PORTABLE PUMPS. Complete catalog of line covering these items, with illustrations, construction details, prices, etc. *Sterling Machinery Corp.*

W. C. WATSON *H. G. HOULTON* *V. V. McGREW*

MEN IN THE NEWS

Brewster Co., Inc., Shreveport, La., manufacturers of oil-field equipment, has added to their sales force **William C. (Bill) Watson**, recently of the U. S. Navy.

John E. Slaughter, Jr., vice president of The Girdler Corp., Louisville, Ky., in charge of the firm's Votator division, announces the promotion of **Dr. Harold G. Houlton** to manager of Votator's technical service.

Verne V. McGrew has joined Southwell Supply Co., Houston, Tex., as general salesman in the Mid-Continent area. McGrew entered the supply business in 1913 with Oilwell Supply Co., at Lawrenceville, Ill. He joined Frick & Lindsay Co. in 1917, and transferred to Frick-Reid, now Jones & Laughlin Supply Co. in 1919, and for the past 25 years has served that company.

M. M. Mautner has been appointed vice president in charge of industrial relations for Plomb Tool Co.

Two changes in the sales executive organization of Fairbanks, Morse & Co. have just been announced by **Robert H. Morse, Jr.**, vice president and general sales manager. Now acting manager of the railroad division is **John S. King**, formerly manager of the company's pump division. He succeeds **C. H. Wilson**, who is on an extended leave of absence due to his health. **Arnold G. Brown**, formerly assistant manager of the pump division, succeeds King as manager of that division.

John B. Macauley has been appointed director of engineering research for Ethyl Corp. to succeed **Earl Bartholomew**, who became general manager of research laboratories. Macauley has been chief of applied research for Pratt & Whitney Aircraft for the past 2 years and for many years was chief of the engine laboratory of Chrysler Corp.

A. J. Bartlett has been appointed manager of industrial engine sales for Le Roi Co., Milwaukee, Wis. He has been with Le Roi since 1935.

M. M. MAUTNER *A. G. BROWN* *A. J. BARTLETT*

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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10th Anniversary

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The Master RUST Preventive

A decade ago this organization of industrial engineers and chemists began a collaboration that constantly is increasing its momentum and usefulness to American industry.

After a strenuous war service, NOX-RUST now is bending its efforts to encompass the widely-varied rust-proofing needs of post-war industry.

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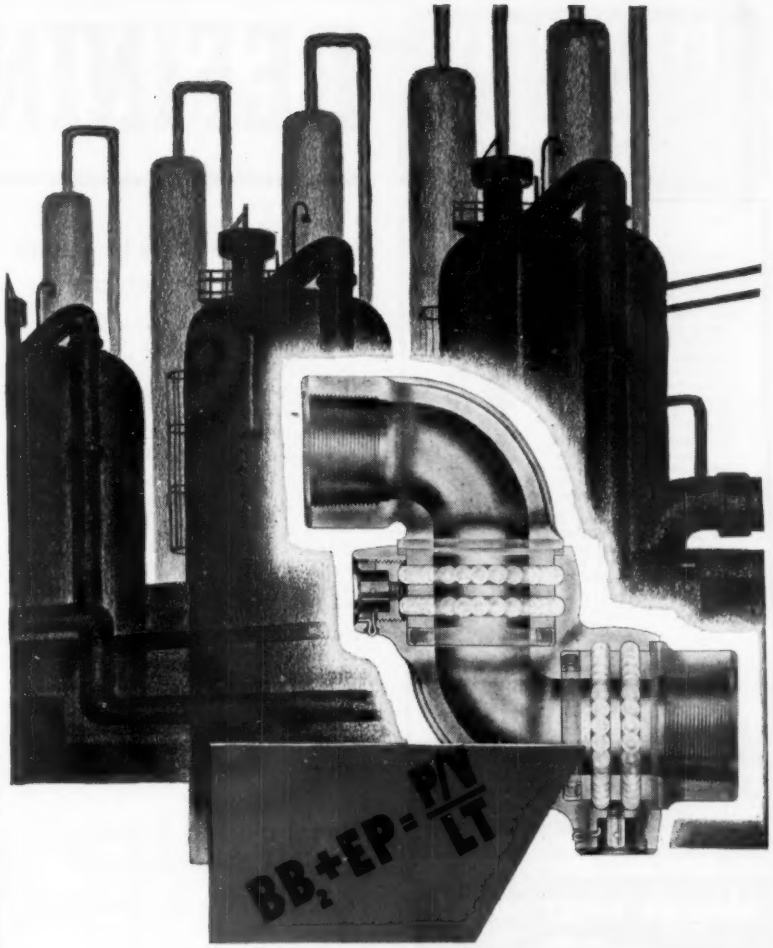

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CHIKSAN **BALL-BEARING** Swivels got their start and built their reputation for perfect flexibility in the Petroleum Industry. As this Industry became more and more important as a vital source of materials for the manufacture of synthetic products, Chiksan Swivels have proved their adaptability to every need . . . wherever flexibility is required . . . on lines handling steams, acids, alkalies, chemical compounds, gas, gasoline, etc. Many new applications have been developed to speed up production for war and for peace. There are over 500 different Types, Styles and Sizes of Chiksan Swivels. Tell us your requirements and we'll be glad to suggest those best suited to your specific needs.

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EP = Effective Packing Element
P/V = Pressure or Vacuum
LT = Low Torque under all conditions

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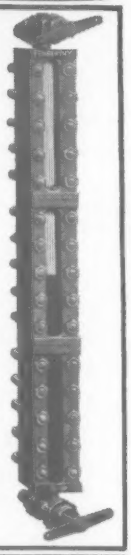
"REFLEX"
DROP FORGED STEEL
LIQUID LEVEL GAGES

Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



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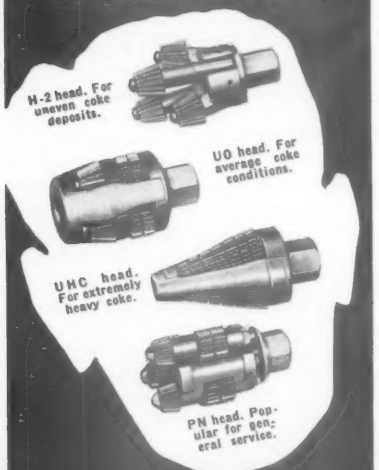
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Heads that win!


H-2 head. For uneven coke deposits.
UO head. For average coke conditions.
UHC head. For extremely heavy coke.
PN head. Popular for general service.

Put one of these cutter heads on the business end of an Elliott 1100 Series Tube Cleaner, and win quick return to production of coked up stills. One of these Elliott heads is *right* for your coke conditions.

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COMPANY
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SPRINGFIELD, O.
District Offices in Principal Cities

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REFINING

Sales of Gasoline in Texas Show Marked Increase

AUSTIN. — Sales of gasoline by Texas distributors to Government agencies and tax-paid sales to civilians during the fiscal year ended August 31 showed a substantial increase over those of preceding years. These sales totaled 1,392,347,716 gal. for the year.

In August this year, civilians bought 140,879,206 gal. and federal agencies, including the Army and Navy, 286,954,803 gal. This compares with August 1944 purchases of 270,656,672 gal. for the Government and 111,393,741 for taxpaying Texans.

Tax collections in September, based upon August gasoline sales, reached $5,457,950, largest in many months, and were $114,262 greater than August collections.

"Revolution in Refining" At Hand, Says Egloff

CHICAGO.—"A revolution in petroleum refining which means better gasoline for motorists the world over" was declared to be at hand by Dr. Gustav Egloff, research director of Universal Oil Products Co., addressing the Mexican - American conference on industrial research.

A small, compact catalytic cracking unit which places the latest refining technique within the grasp of all small refiners has been developed by Universal, Dr. Egloff said. It had not been intended to make this announcement for several months, but it was decided to release it as a special contribution to the Mexican-American conference.

"We now have a small catalytic cracking unit for 500 bbl. a day," the speaker told the conference delegates. "It will be economical for the smallest refiners. It will be useful not alone in the United States, but in Mexico and other countries.

"Despite the growth and development of catalytic cracking, the thermal method still holds its place and will be of value for some years to come.

"The petroleum industry of Mexico faces a bright future. New producing fields can be expected to come to light through the exploration program going on. An extensive program of refinery improvement and expansion is being planned.

"Never in the history of the oil industry have there been so many new and better tools available to implement your oil improvement program as are at hand today.

"We are entering a new era in petroleum. The key which has unlocked the door to new vistas of opportunity for the oil industry and new benefits for the peoples of the world's phenomenon known as catalysis.

"All the modern refining processes which produced the 100-octane gasoline components of synthetic rubber, toluene and other special products that played so great a part in winning the war, are now available and are being fitted into the pattern of peacetime refining."

Plant's Annual Output of Alcohol 20,000,000 Gal.

BATON ROUGE, La.—The Baton Rouge refinery of Standard Oil Co. of New Jersey is now producing 20,000,000 gal. of alcohol annually, according to M. W. Boyer, plant manager, who said it was expected to increase this rate of output.

The alcohol can be sold at a profit for around 26 cents a gallon, 30 to 35 per cent of the Government's paying price for grain alcohol.

The refinery also is producing 33,000 tons of synthetic rubber a year, 15,000 tons of butadiene, rub-

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ber raw material, and large volumes of automobile and aviation gasoline. The plant reached a peak of 2,520,000 gal. of motor gasoline daily in September, but this is not considered representative.

The labor situation at the plant has been somewhat unsettled in view of refinery strikes elsewhere. An independent union has not threatened to strike, but is asking a 30 per cent wage increase. The company has offered 15 per cent for a cutback from a 48 to 40-hour week. A federal conciliator is at work.

Commission Promises Oil For Operating Refineries

AUSTIN. — The Texas Railroad Commission has promised, in a formal statement of policy, that a sufficient supply of crude oil will be made available for all operating refineries.

"In case any refinery does not have sufficient crude oil to operate, it will be given prompt relief upon telegraphic request to the commission," said the statement, signed by all three members. "The commission intends that there shall be sufficient oil to supply all refineries that are operating."

This policy was adopted following complaints from several refineries that they are not subject to strike conditions, and that the recent drastic cut in October production days will shut off their potential supplies of crude. The commission cut back allowable production because of refinery shutdowns.

Bureau Rules Bulk-Plant Agents Are Contractors

WASHINGTON.—The tax status of commission agents who operate bulk plants for refining companies is clarified by a report from Bureau of Internal Revenue in which its position is summarized.

The report deals with representative cases of refiners, in which the bureau has held that bulk-plant agents are independent contractors and not company employes for federal employment purposes.

The cases are those of The Texas Co. vs. Higgins, Indian Refining Co. vs. Dallman, American Oil Co. vs. Fly, Orange State Oil Co. vs. Fahs, Glenn vs. Standard Oil Co., and Gulf Oil Corp. vs. United States. These cases have been in various stages of adjudication for several years.

A statement by Joseph D. Nunan, Jr., bureau commissioner, now asserts that in conformity with decisions in these cases, the bureau will regard all bulk-plant agents who operate in circumstances substantially similar to those in the cited cases as independent contractors and not as employes.

"Any such bulk-plant agent who hires, pays and controls employes on his own behalf is the employer of such employes for feredal employment tax purposes," it is stated.

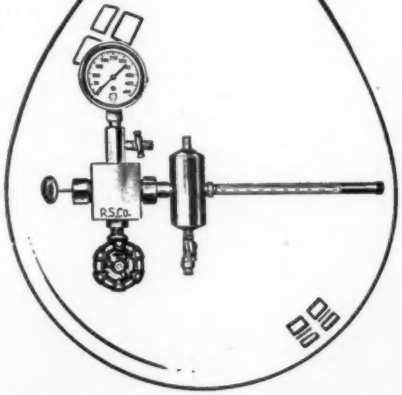
The statement says that a ruling given earlier that such agents are not employes is restricted to cases in which the facts, as in the decisions cited, do not disclose such control or right of control over details and means of operation as is sufficient to establish relationship of employer and employe. If doubt exists in a particular case, the commissioner said it should be referred to the bureau.

In the case of The Texas Co. vs. Higgins, the company gave the distributor a manual outlining proper operation of its bulk stations, but the court found the distributor was not required to observe admonitions of the manual.

DEW-POINT TESTER

Bureau of Mines Type

- **Determines dew-point of gases under conditions of pressure as they are found to exist.**
- **Designed primarily for use in connection with high pressure gas transmission lines.**



- **Accurate within 0.2° F.**
- **Standard range 0 to 600 P.S.I.**
- **High Pressure range to 2,500 P.S.I.**
- **Easy to operate and easily adjusted.**

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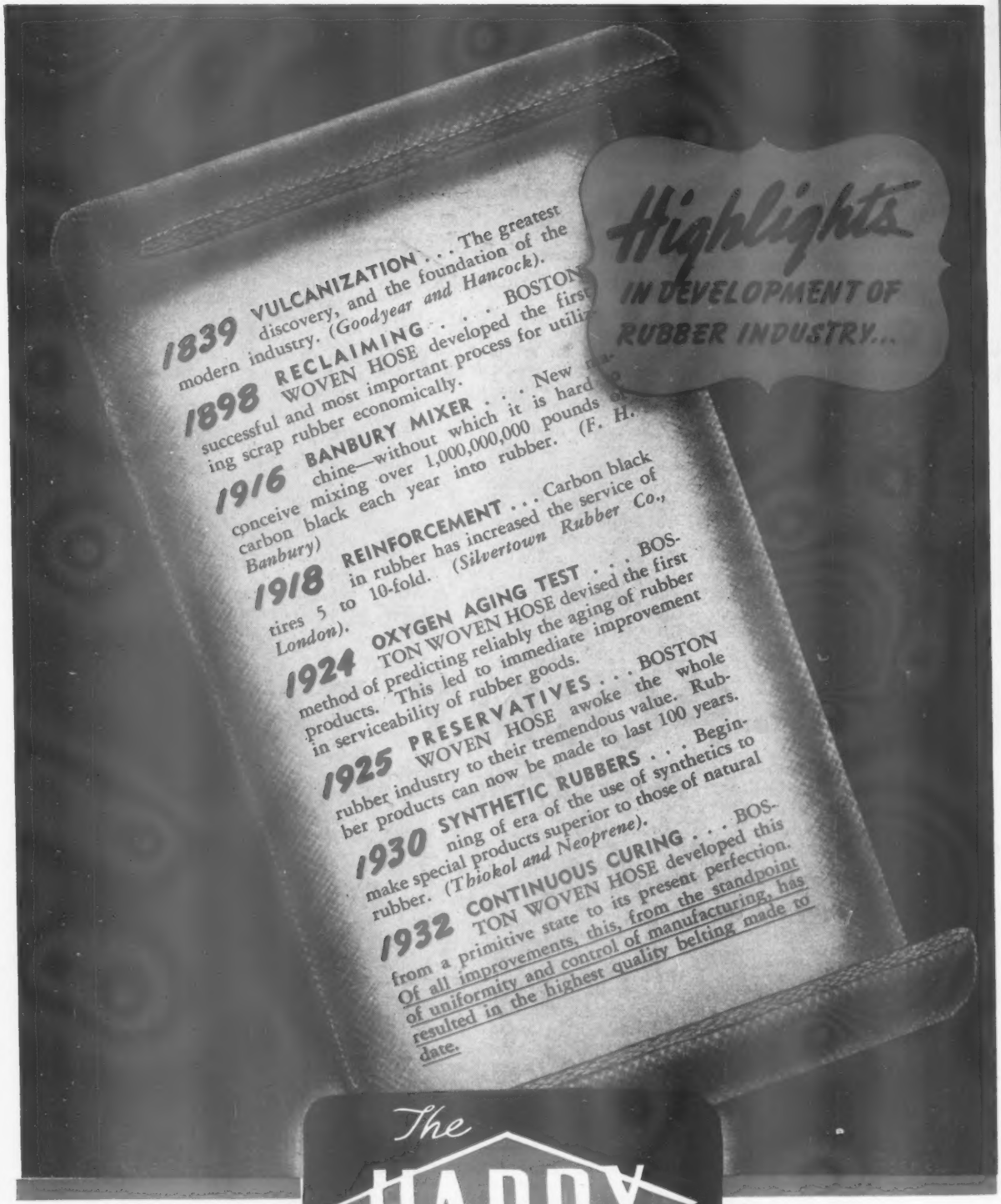
Highlights
IN DEVELOPMENT OF
RUBBER INDUSTRY...
1839 VULCANIZATION . . . The greatest discovery, and the foundation of the modern industry. (Goodyear and Hancock).
1898 RECLAIMING . . . . BOSTON WOVEN HOSE developed the first successful and most important process for utilizing scrap rubber economically.
1916 BANBURY MIXER . . . New machine—without which it is hard to conceive mixing over 1,000,000,000 pounds carbon black each year into rubber. (F. H. Banbury)
1918 REINFORCEMENT . . . Carbon black in rubber has increased the service of tires 5 to 10-fold. (Silvertown Rubber Co., London).
1924 OXYGEN AGING TEST . . . BOSTON WOVEN HOSE devised the first method of predicting reliably the aging of rubber products. This led to immediate improvement in serviceability of rubber goods.
1925 PRESERVATIVES . . . BOSTON WOVEN HOSE awoke the whole rubber industry to their tremendous value. Rubber products can now be made to last 100 years.
1930 SYNTHETIC RUBBERS . . . Beginning of era of the use of synthetics to make special products superior to those of natural rubber. (Thiokol and Neoprene).
1932 CONTINUOUS CURING . . . BOSTON WOVEN HOSE developed this from a primitive state to its present perfection. Of all improvements, this, from the standpoint of uniformity and control of manufacturing, has resulted in the highest quality belting made to date.
The HAPPY COMPANY
Formerly HAPPY BELTING COMPANY
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Rubber Belting
Leather Belting
V Belts
V Belt Sheaves
Happy Pumping Units
Power Transmission Equipment
BRANCH OFFICES:
Seminole ..... Oklahoma
Smackover ..... Arkansas
Odessa ..... Texas
Kilgore ..... Texas
Pampa ..... Texas
Salem ..... Illinois
Wichita ..... Kansas
Ellinwood ..... Kansas

Natural Gas

Personnel Conference Held By Midwest Gas Group

OMAHA.—The first session of the American Gas Association Midwest Personnel Conference was held at the Fontenelle Hotel here, with R. B. Harkins, personnel director of Panhandle Eastern Pipe Line Co. and chairman of the conference, presiding. The new territory had been added to the conference in conformity with action taken at the annual meeting of Midwest Gas Association.

Burt R. Bay, president of the Midwest association, welcomed the group. Kurwin R. Boyes, secretary of American Gas Association, welcomed the new members on behalf of the conference and explained the purpose of the meetings as affording personnel executives opportunities to discuss problems and experiences. Gordon M. Peterson, Public Service Electric & Gas Co. of New Jersey, chairman of the A.G.A. personnel committee, reviewed the industrial-relations activities of the association, told of current problems, and asked for thorough consideration of personnel matters in the industry. Reduction of war contracts, handling of returned veterans, and training aptitude tests were discussed.

It was decided to hold the next conference in Kansas City on November 8.

Gas and Carbon-Black Tax Revenues Up in Texas

AUSTIN.—Increased revenue from taxes on natural gas and carbon black for the year ended August 31 is revealed in the report of George H. Sheppard, state comptroller. The natural-gas tax, 5.2 per cent of the market value at the well, produced $3,719,391 in 1944-1945, compared with $3,245,702 the year before. The carbon-black tax yielded $819,668, which is below last year's $932,241 only because a judgment for $267,432 in taxes for earlier years was collected in 1943-1944.

The first hearing under a new law authorizing the comptroller to ascertain fair market value of gas for tax purposes, where the price is not posted, was held in Austin, September 27. It covered gas production of Sinclair Prairie Oil Co. in Texas.

The comptroller said value of gas at the well-mouth, for tax purposes, now is about 3⅛ per cent in the statewide averaging. Sweet gas ranges in value from 2½ cents a thousand in West Texas to 6 cents in some other areas. Average price in the Panhandle, Carthage, and Gulf Coast areas, where production is greatest, is 4 cents a thousand.

Exportation Itself Is Not an Issue, Says I. N. G. A. A.

KANSAS CITY.—Independent Natural Gas Association of America, in a telegram to Federal Power Commission, contends that exportation of natural gas is not in itself an issue and urges that in considering Panhandle Eastern Pipe Line Co.'s petition for authority to transport gas into Canada the commission shall "not be prejudiced because of exportation alone."

The case is being heard in Washington, and the association's wire was sent from here by its counsel, Wesley E. Disney, who explained that his participation in the commission inquiry being held in Kansas City prevented his going to Washington to present the association's position. The wire said the association desired to have the following incorporated in the record of the FPC hearing.

"The Independent Natural Gas Association of America is convinced that known gas reserves of over 140 trillion cubic feet of natural gas warrant its sale in any market available and that such sales will promote conservation of natural gas. The association respectfully urges that an application for a certificate to export natural gas should not be prejudiced because of exportation alone, and the question of granting or denying such application should rest entirely on other grounds."

Changes in Gas Service Deferred Pending Hearing

WASHINGTON.—Proposed changes in conditions of service in the sale of natural gas by Cincinnati Gas Transportation Co. at wholesale to Cincinnati Gas & Electric Co., of Cincinnati, and Union Light, Heat & Power Co., Covington, Ky., have been suspended by Federal Power Commission. The changes relate principally to the period for which service would be rendered. Twenty-year terms would be substituted for provisions permitting termination of service upon 6-month notice. The proposed agreements may not be canceled in less than 5 years from the date the purchasers first give notice to Cincinnati Gas Transportation Co. All three companies are Columbia Gas & Electric Corp. subsidiaries.

The FPC order says the proposed provisions may be inconsistent with the public interest and place an undue burden upon ultimate consumers and directs attention to the application of Metropolitan Eastern Corp. requesting authorization to construct a natural-gas line from the Carthage field, Panola County, Texas, to Cincinnati, which is set for hearing October 15. The order further points out that the transportation company's rates are being investigated by the commission.

The proposed changes are deferred, pending a hearing to be held on a date to be announced concerning the lawfulness of such changes, until February 18, 1946, and thereafter until made effective in the manner prescribed by the Natural Gas Act.

Cycling

Plans Made for Processing Units in Carthage Field

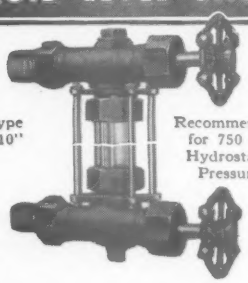
AUSTIN.—Plans for a two-unit plant for processing natural gas produced in the Carthage field, Panola County, have been presented to examiners for the State Railroad Commission.

Lone Star Gas Co., Roger Lacy, and others seek permission to conduct cycling operations in the field. Lone Star and Lacy would construct a plant with a cycling unit capable of extracting liquids from 50,000,000 cu. ft. of gas daily and returning the gas to upper Pettit sand leases owned by Lacy and his associates. The plant would draw from leases comprising 11,000 acres.

The second unit, of the same daily capacity, would be a gasoline-extraction plant with its residue gas to be delivered to a Lone Star pipe line. The pipe line will be of 100,000,000 cu. ft. capacity, although the full amount would not be needed presently, the commission was told.

The pipe line would be laid to the location of the plants, 9 miles north of Carthage, from the Lone Star's plant at Trinidad in Henderson County, a distance of approximately 100 miles. Preliminary work is under way on the projects.

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



Type "10"

Recommended for 750 lb. Hydrostatic Pressure

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PIPE LINES

Mardis Succeeds Welch for Ohio Oil at Bridgeport

FINDLAY.—Earl S. Mardis, formerly assistant division superintendent of The Ohio Oil Co.'s pipe-line department at Bridgeport, Ill., has been promoted to division superintendent, succeeding E. C. Welch, who retired October 1.

Mardis started work at 18 with Tide Water Pipe Line Co. in Illinois. He went to Ohio Oil in 1918 as a pumper in the Robinson, Ill., field. In 1923 he was transferred to the Wyoming field, where he worked in various capacities until 1941, when he returned to Illinois as assistant to Welch.

E. S. MARDIS

E. C. WELCH

Welch, familiarly known as "Shorty," started with Prairie Pipe Line Co. at Carrollton, Mo., in 1902. He joined Ohio Oil at Casey, Ill., in 1906, and worked as gager, tank strapper, connection foreman, general superintendent and division superintendent.

WEP Empties 20-in. Products System

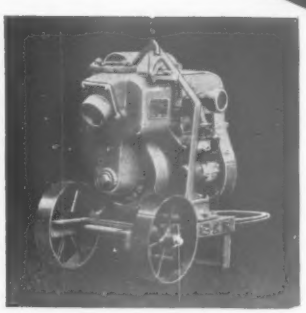
War Emergency Pipelines, Inc. is pumping water containing sodium hydroxide into the 20-in. line to displace products from the system extending from Beaumont, Tex., to Linden, N. J. Contents of the line are reported to be military products most of which is 100-octane gasoline. After products are entirely removed, the water will be evacuated by means of compressor equipment at a central point which will inject carbon dioxide; since this is an inert gas it will insure the safety of the operation. The evacuation process for the 20-in. line is expected to be completed by December 1.

Similar evacuation methods are to be applied to the WEP Longview, Tex., to New York and Philadelphia 24-in. crude-oil line after it will be shut down October 15; evacuation of this system is supposed to be completed December 15.

After both lines are completely evacuated, a skeleton organization will be established to guard the facilities, maintain the lines, and to carry out a program for mitigation of corrosion.

The O'Mahoney committee of the U. S. Senate is reported to have plans for conducting a public hearing shortly after the middle of October for discussing the future of the WEP systems. Reconstruction Finance Corp. advertised last week the sale or leasing of WEP. Tariffs have been canceled for Southwestern Emergency Pipe Line and this facility as well as the Trans-Florida line, the Richmond, Va., extension of Plantation Pipe Line and a products line in Ohio have been advertised for sale.

PIPE LINE SUPPLIES AND EQUIPMENT



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There's a model for every pumping requirement . . . for pumping from 5 to 2100 gallons per minute. The most dependable pump for the least money.

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CONQUER CORROSION

Get complete protection for all kinds of above and below ground piping and every type of pipe line structure with these proven conquerers of corrosion.

"BITUMASTIC" HOT APPLIED PIPE LINE COATING

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CATHODIC PROTECTION UNITS . . . HOLIDAY DETECTORS

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DALLAS TEXAS

SOUTH AMERICA
APARTADO 1085
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Kansas City, Missouri

PIPE LINES

FRANK E. RICHARDSON

CONSULTING ENGINEER

904 INSURANCE EXCHANGE BLDG.
KANSAS CITY 6, MISSOURI

Shell to Lay 60 Miles For West Texas System

Shell Pipe Line Corp. has received bids for laying 60 miles of 6-in. and 8-in. lines to enlarge its West Texas system. The work to be undertaken includes laying an 8-in. line parallel to the existing 6-in. line between Wheeler station and Monahans junction; this 8-in. will be extended 22.6 miles to the new Ratliffe & Bedford well in southwest Andrews County, Texas. Furthermore, other lines will be laid parallel to existing lines, representing legs of the gathering system connecting Wheeler station with the Wheeler field and with the TXL area to provide for segregating movements of Devonian and Ellenburger production.

The program also provides for installing sufficent tankage and pumping equipment at Wheeler station to provide for delivering a portion of the production to Atlantic Pipe Line Co.'s 10-in. trunk lines, a mile south of Shell's Wheeler station, which delivers from Hendrick to Midland. Atlantic will lay 1 mile of 8-in. from its line to Wheeler station.

Shell is also laying 9 miles of 6-in. from Abell junction on its Hendrick-Monahans- Barnsley-McCamey line to the Crane station of Texas-New Mexico Pipe Line Co. to provide for delivering TXL crude oil via its Monahans junction and its Abell junction into Crane station for shipment to Lake Charles, La., via Texas-New Mexico Pipe Line Co. to Houston, Texas Pipe Line Co. to Sour Lake and by Empire Pipeline Co. to its destination.

Construction Starts on Gulf's Loop Program

Pipe laying started last week for Gulf Refining Co.'s project for laying approximately 470 miles of 8-in., 10-in., and 12-in. loops between West Texas and Port Arthur, Tex. J. R. Horrigan Construction Co. was laying pipe near the Chester station for the section where it is now working between Sour Lake and Chester. Associated Constructors & Engineers' spread was scheduled to lay pipe near Lufkin this week. Pipe was due to arrive for Oklahoma Contracting Co.'s spread about October 12 for laying from Midland toward Keystone.

Stanolind Pushes Wind River Job

Stanolind Pipe Line Co. has laid 20 miles of the 69 miles of the pipe for the Wind River Basin line from Pilot Butte to Lysite, Wyo. It has also completed 22 miles of 6-in.

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GEARED TO THE JOBS

. . . will deliver maximum ditching performance day in and day out, whether it's Long Main Lines, Gathering Lines, Reconditioning, Stripping Pipe or ordinary Maintenance.

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McVEAN & ROBERTS CONSTRUCTION — M&R PIPE LINE

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PRE-TESTED TO OIL-FIELD STANDARDS

DAY in and day out, Lone Star Cements are PRE-TESTED under high pressures and temperatures . . . pre-tested for strength . . . pre-tested for performance under severest service conditions. Tested ever step of the way — from raw material to railroad car. Tested for assured performance in Oil Industry service. Use the cement that fits your job: For deep wells, 'Starcor'* with high resistance to sulphate-water action. For deepest wells, 'Texcor'* with extra-long thickening time . . . highly resistant to action of sulphate waters. 'Incor'* for earlier drillout in moderate-depth wells. Lone Star Cement for dependable service, above-ground or below. Four great job performers — use 'em and see for yourself.

*Reg. U. S Pat. Off.

LONE STAR CEMENT CORPORATION · DALLAS · HOUSTON

Exploration and Drilling

Week's Highlights

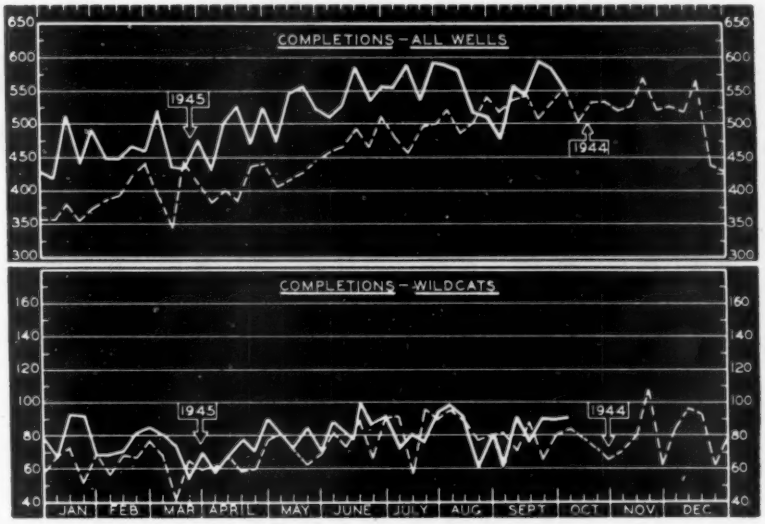
THE Oklahoma Panhandle has an oil well. That is the important news this week, because it means that the oil companies and geologists who have been making plays and studying the tristate corner area of Colorado, Kansas, and Oklahoma have something tangible to point to. It opens up a new oil-producing region at least a hundred miles from the nearest oil production. (See The Oil and Gas Journal, August 11, 1945, p. 139.)

The Pure Oil Co. 1 Oklahoma State, SE SE NW 7-5n-8ecm, Cimarron County, Oklahoma, is flowing by heads, 90 to 100 bbl. daily of 38°-gravity oil, through 7-in. casing, while cleaning out after shooting. The oil is coming from a sand in the basal Pennsylvanian.

This well was originally drilled with rotary tools to 5,160 ft., and 7-in. casing set at 4,779 ft. A limey sand section reported at about 4,786-90 ft. was acidized and the well swabbed 7 to 10 bbl. of oil plus acid water, but caved badly. Rotary was moved off and a cable-tool unit moved in to clean out and put the hole in shape.

After considerable trouble, over a period of about 2 months, the hole was put in shape last week and shot with 40 qt. at 4,824-44 ft. It was still cleaning out at 4,828 ft., while flowing by heads. Reports are that a sand section immediately above the shot looks gassy, and it may be shot after testing the present flow.

Pure has a block, variously reported at from 60,000 to 90,000 acres,



Solid line charts current weekly completions, service wells in Eastern area included

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 6, 1945

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1945				
	Comp.	Oil	Gas	Dry	Footage	1945	1944	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	32	16	0	*16	44,210	1,115	1,215	0	0	0	0	0	0	0	0	0	0
Pennsylvania	72	37	2	†33	117,145	3,139	3,162	0	0	0	0	0	0	0	0	0	0
West Virginia	11	0	9	2	32,453	612	663	0	0	0	0	0	0	0	0	0	0
Ohio	21	4	9	8	54,054	721	760	0	0	1	1	2	0	0	12	50	62
Indiana	3	0	1	2	4,789	151	192	0	0	0	0	0	5	0	0	23	28
Kentucky	15	12	0	3	24,370	404	568	0	0	0	1	1	19	0	4	39	62
Illinois	41	25	0	16	109,208	1,370	1,427	3	0	0	5	8	40	0	0	241	281
Michigan	26	4	0	22	66,512	583	500	0	0	0	16	16	9	0	3	213	225
Kansas	40	16	11	13	123,759	1,320	1,389	1	0	0	6	7	29	0	12	261	302
Neb., Mo., Iowa	1	0	0	1	4,580	19	31	0	0	0	1	1	0	0	0	14	14
Oklahoma	45	29	2	14	186,622	1,857	1,372	1	0	0	7	8	70	3	15	278	366
Texas	160	90	19	51	671,401	5,508	4,260	3	0	1	22	26	163	12	49	971	1,195
North Central	57	31	3	‡23	125,670	1,696	1,126	0	0	0	9	9	62	0	5	342	409
West	32	25	1	6	157,770	1,366	1,197	1	0	0	2	3	43	1	0	194	238
Panhandle	14	6	8	0	45,369	431	201	0	0	0	0	0	0	0	1	5	6
Eastern	6	3	2	1	36,220	256	244	0	0	0	1	1	5	6	2	65	78
Gulf Coast	43	21	5	17	275,638	1,260	956	1	0	1	8	10	39	4	32	222	297
Southwest	8	4	0	4	30,734	499	536	1	0	0	2	3	14	1	9	143	167
Louisiana	16	7	3	6	92,831	798	608	0	0	0	1	1	25	3	6	95	129
Northern	9	1	3	5	35,500	324	242	0	0	0	1	1	7	1	6	54	68
Southern	7	6	0	1	57,331	474	366	0	0	0	0	0	18	2	0	41	61
Arkansas	4	2	0	2	12,548	136	168	0	0	0	1	1	1	0	0	29	30
Mississippi	7	1	0	6	57,210	281	110	0	0	0	5	5	5	0	0	94	99
Southeastern	1	0	0	1	5,096	46	38	0	0	0	1	1	1	0	1	32	34
Montana	2	1	0	1	5,458	239	276	0	0	0	1	1	7	0	0	21	28
Wyoming	3	2	0	1	14,156	162	132	0	0	0	1	1	14	0	1	31	46
Colorado	4	3	0	1	31,631	41	29	0	0	0	1	1	1	0	1	8	10
New Mexico	8	7	0	1	36,202	319	300	2	0	0	1	3	10	0	4	47	61
California	40	27	1	12	141,843	1,754	1,532	0	0	0	9	9	3	0	2	180	185
Total United States	552	283	57	212	1,836,078	20,575	18,732	10	0	2	80	92	402	18	110	2,627	3,157
Total previous week	583	323	58	202	1,963,161	20,023	18,149	15	0	1	72	88	392	18	108	2,547	3,065
Total Oct. 7, 1944	546	300	52	194	1,829,824	18,732	13,388	10	0	2	72	84	341	23	98	2,461	2,923

Service wells included: *16, †29, ‡1.

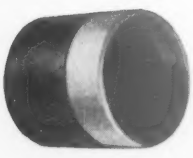
..... for more efficient slush pump performance

Use all MISSION PUMP PARTS

MISSION *Super-Surfaced* PISTON RODS

Around an extra high strength core, with a tensile strength of 120,000 pounds, and exceptionally high ductility, Mission Piston Rods have a File Hard case developed by Mission's special combination of heat treatment and rod material. Then Mission adds a **super-surface** which increases the wearing qualities by two to four times. Mission Super-Surfaced rods stay smooth even when salt or brackish wash water is used.

MISSION *Self-Sealing* GLAND PACKINGS



use only pump pressure to tighten the packing automatically during the pressure stroke—just enough to insure a perfect seal. They run free on the return stroke, when tight packing is not needed. As a result, Mission Packings seal perfectly all the time with a great reduction in packing and rod wear.

MISSION *Fluid End* PISTONS

"Change the Rubbers and Save the Piston."

Mission piston rubbers, because of tough rubber compound and advanced design, are extremely long wearing and trouble free. But even when the rubbers are finally worn, you don't have to throw away the entire piston. Simply remove the rubbers and replace them with new ones, at the rig, without even removing the piston body—and you are ready for another long run at a fraction of the cost of a new piston.

MISSION *Slush Pump* VALVES

A small replaceable bushing takes the wear instead of the more expensive valve seat—greatly increasing valve seat life. This means lower replacement costs and less time spent changing valve seats. Since the seat stays in the pump longer without removal, danger of washouts between seat and deck is reduced.

New, Compound-308 Inserts last from three to five times as long as regular inserts in ordinary mud, and up to ten times longer than ordinary oil resisting inserts in hot mud, treated mud, or oil and gas.

PULL THE BUSHING *and* SAVE THE SEAT

They work best together for long uninterrupted service....

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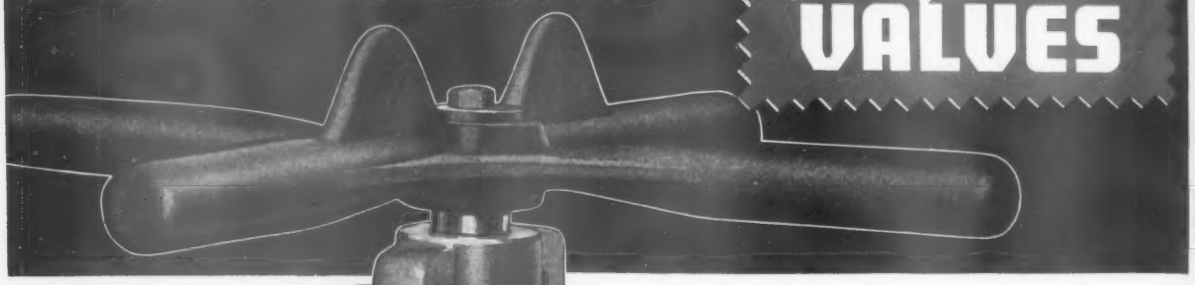
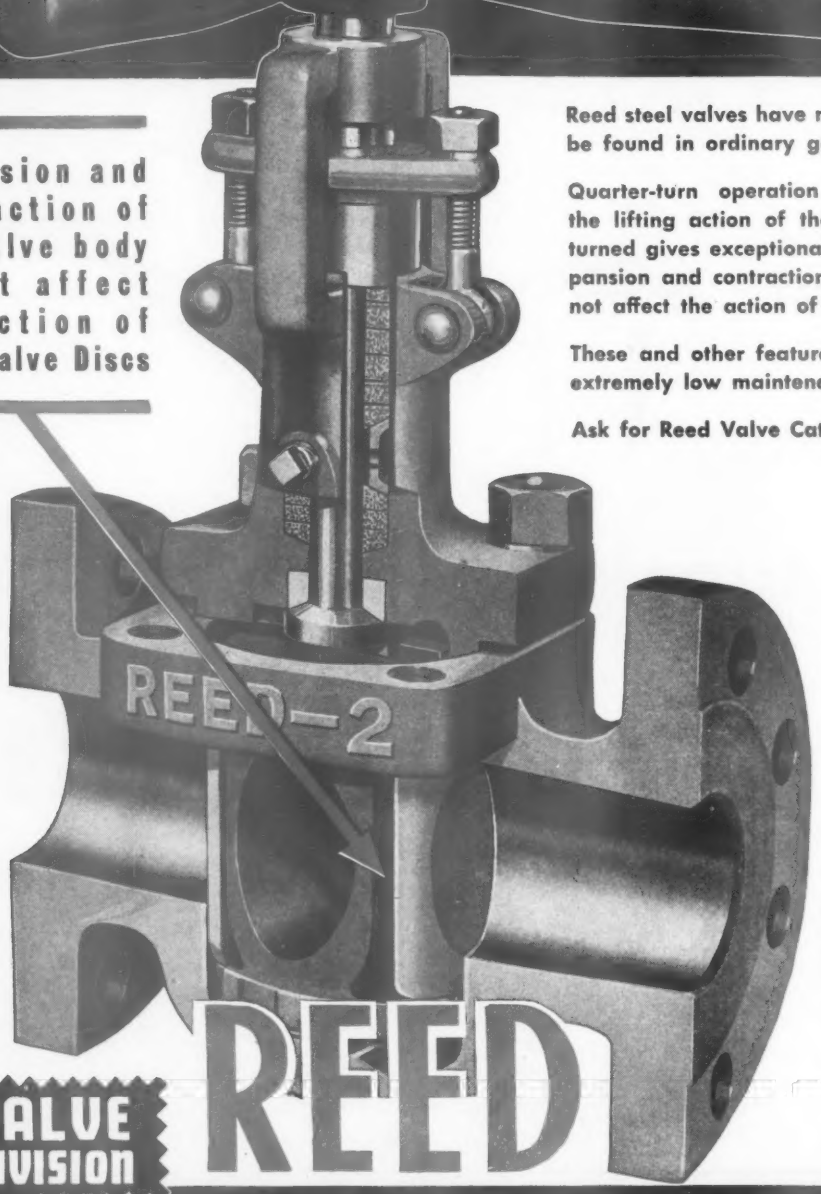
MUNDELL ROAD

The Gate Valve with quarter-turn operation... especially designed for EASE OF OPERATION

REED
Quarter-turn Double Disc Gate
VALVES



Expansion and contraction of the valve body do not affect the action of Reed Valve Discs



Reed steel valves have many advantages not to be found in ordinary gate valves.

Quarter-turn operation gives instant action; the lifting action of the discs as the valve is turned gives exceptional ease of operation; expansion and contraction of the valve body do not affect the action of the discs.

These and other features assure long life with extremely low maintenance costs.

Ask for Reed Valve Catalog 41 . . . NOW.

Available in Series 150 and 300, 1" through 6" Reed Steel Valves are interchangeable with wedge gate valves.

Reed Steel Valves can be furnished with a full fabricated jacket for the handling of viscous materials.

VALVE DIVISION

REED

P. O. BOX 2119 **ROLLER BIT COMPANY,** HOUSTON, TEXAS

on which the oil discovery is the fourth well completed (two gas wells and one dry hole previously), with the fifth, 1 Johnson, SW SW SE 12-5n-7ecm, reported drilling at 4,362 ft., and checking about even structurally with the oil well. Early gravimeter work by others is reported to have been done in this area, but Pure, after finding seismograph work unsatisfactory in the area, did extensive core drilling.

Bottom-hole pressure in the gas wells is reported 850 psi., whereas normal should be around 2,000 psi. This is intriguing because both Hugoton and Amarillo, nearest producing areas, also have abnormally low pressures, about 30 per cent of normal. Yet Hugoton and Amarillo produce from the Permian, far up in the geological column from the basal Pennsylvanian of Pure's wells.

TEXAS GULF COAST

Nash Dome Production Reopened in Fort Bend

HOUSTON.—New production has been opened by the Danciger Oil & Refining Co. at 1 Theodor Meier, in H. N. Cleveland Survey on north flank of the old Nash dome in Fort Bend County. Drilled to a total depth of 5,892 ft. in second sidetracked hole, it is reported to have approximately 50 ft. of sand in upper Frio. Perforations were made at 5,865-75 ft. and on a drill-stem test using 500 ft. water cushion, ¼-in. chokes top and bottom, it recovered the cushion, showed pipe-line oil in 29 minutes, 550 lb. working pressure, and at last report was flowing steadily. Gravity of the oil is 31°. This is first production for north flank of the dome. Approximately 1,725,000 bbl. of oil were produced some years ago from wells on south flank but there are no more wells producing in that area.

Second well for the Altair field in Colorado County, Superior Oil Co. 3-A Mrs. Matilda Tait, flowed a Railroad Commission potential of 238 bbl. daily through 12/64-in. choke through 60 perforations at 8,264-74 ft. Gas-oil ratio was 4,340 to 1, tubing pressure 2,025 lb., gravity 56°, no water. Totai depth is 8,440 ft., with 7-in. casing set on bottom. This well is a northeast offset to their 2-A Matilda Tait, discovery well for the area.

Union Producing Co. 1 Langtry, North Houston area, Harris County, is drilling ahead from 7,553 ft. in shale with hard streaks. Drill-stem test at 7,484-7,501 ft. had shown gas. This well has shown oil in the Murphy sand, and salt water in the Goodykoontz sand.

There were 17 new locations reported this week, 3 being wildcats, 2 in Trinity County and 1 in Harris County. Of the 19 completions 5 were wildcats, all dry, 2 in Jackson, 1 each in Austin, Harris, and Washington counties. Fayette County led with three completions. Brazoria, Harris, and Jefferson counties each had two completions.

UPPER GULF COAST WILDCAT FAILURES

Austin County: Union Producing 1-A John E. Hintz, H&TC Survey, Abstract 214, Section 179, 3 miles west of Sealy, dry at 9,072 ft.

Harris County: Traders Oil of Houston 1 Deepwater Land Co., James Seymour Survey, 2 miles east of Pasadena, dry at 7,349 ft.

Jackson County: Wright Drilling Co. 1 C. M. Hasdorff, Jos. Rector Survey, Abstract 62, 5 miles southeast of Edna, dry at 6,755 ft.

Wirt Franklin Petroleum 1 Rose & Sample, Thos. H. P. Heard League 2 miles southeast of Cordele, dry at 2,806 ft.

Washington County: Rutledge & Clark 1 Strzelecki, E. R. Miller Survey, 4 miles north of Chapel Hill, dry at 7,501 ft.

EASTERN TEXAS

Freestone County Test Is Distillate Discovery

DALLAS.—The Texas Co. 1 Ham, R. Lawson Survey, wildcat 4 miles east and slightly south of Teague, Freestone County, has been completed in the Travis Peak. It tested 4,500,000 cu. ft. of gas daily with an estimated 9 bbl. of distillate per million cubic feet of gas on ¼-in. tubing choke through perforations at 7,980-8,018 ft. A new Woodbine wildcat for Freestone County will be drilled by W. C. Curry 2 miles southwest of Streetman. It is 1 O. Burleson, 2,250 ft. from the northeast line and 3,700 ft. from the northwest line of James Sparks Survey.

Phillips Petroleum Co. 1 Craver, M. M. Long Survey, South Tyler pool, Smith County, gaged 324 bbl. of oil in 19 hours through perforations at 9,110-15 ft. It is still testing. Humble Oil & Refining Co. 1 Gerow, Rogers Survey, Franklin County wildcat 4 miles north of Talco, ran a drill-stem test at 3,635-3,715 ft. and recovered 3,250 ft. of salt water and 150 ft. of drilling mud. It is drilling below 3,885 ft.

Magnolia Petroleum Co. has staked a 9,500-ft. wildcat in Trinity County. It is 1 Oscar Gibson, C. Sanchez Survey, 4 miles north of Apple Springs. Rogers Lacy 1 Verhalen, Aaron Poe Survey, in the Scottsville area of Harrison County, was swabbing a small amount of dark green oil with very little gas from the upper Pettit at 6,340 ft.

Carthage field, Panola County, has two completions and Freestone, Robertson and Rusk counties each had one field completion. Anderson, Freestone, Panola and Robertson counties each had one new field location.

EASTERN TEXAS WILDCAT FAILURE

Red River County: Tex-Harvey 1 T. A. York, C. Groce Sur., 1 mi. SW Lydia, elev. 321 ft., Smackover 7,962 ft.. dry. TD 8,232 ft.

SOUTH LOUISIANA

North Cankton Well Flowing 6 Bbl. Per Hour

NEW ORLEANS.—At North Cankton field in St. Landry Parish, Sun Oil Co. 2 E. Domengeaux, 47-8s-4e, is testing through 45 perforations at 9,584-599 ft., using ⅛-in. choke, flowing 6 bbl. of oil per hour. Tubing pressure is 800 lb., 0.1 per cent b.s. and w. Total depth is 10,500 ft., with 7-in. casing set to bottom.

Union Oil Co. of California 13-A School Board, in East White Lake field of Vermilion Parish, is testing for completion through perforations at 6,121-26 ft. A drill-stem test at this level had shown a flow of 173 bbl. daily through a ⅛-in-choke, gravity 34°, tubing pressure 1,000 lb., gas-oil ratio 480 to 1.

In Terrebonne Parish, Sun 1 Waller, wildcat in the Cedar Grove area, 38-16s-16e, ran electric log to total depth of 10,137 ft. in shale with no shows reported. Operators now are drilling ahead below 10,570 ft. in hard shale and lime.

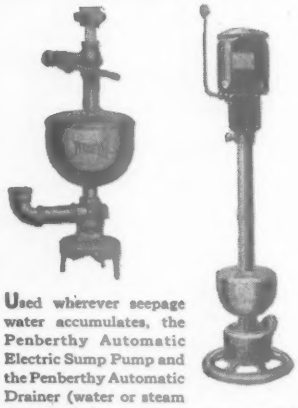
Deep drilling continues in this area with Humble Oil & Refining Co. 1 State-Lake Salvador, wildcat in Lake Salvador, St. Charles Parish, drilling at 11,193 ft. in hard shale with lime streaks. In Allen Parish, Humble 1-B Mrs. J. A. Bell, 33-5s-4w, wildcat in the Oberlin area, is drilling ahead at 11,221 ft. in hard shale

DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 6 crude oil	Distillate, allied products	October PAW quota all oils	Sept. 29 crude oil
Alabama	200		500	200
Arkansas	76,150	5,400	80,400	76,350
California	815,000	60,970	946,970	860,150
Colorado	13,500	.....	12,000	12,400
Eastern	65,950	6,300	72,500	63,400
Florida	100			
Illinois	134,700	12,000	212,000	189,200
Indiana	10,250	.....	13,000	12,900
Kansas	252,150	4,500	278,500	272,500
Kentucky	18,300	2,600	30,600	29,200
Louisiana	355,500	42,000	392,000	362,850
North Louisiana	70,500	.....	.....	70,850
South Louisiana	285,000	.....	.....	292,000
Michigan	44,600	800	47,800	41,200
Mississippi	51,100	.....	47,000	52,550
Montana	23,550	300	23,800	23,550
Nebraska	750		1,000	900
New Mexico	96,400	6,800	106,800	107,300
Oklahoma	383,450	28,000	408,000	391,300
Texas	1,187,100	166,000	2,034,000	1,889,500
East Texas	177,000	.....	.....	315,300
East Central Texas	93,000	.....	.....	128,450
North Central Texas	116,300	.....	.....	141,900
Texas Panhandle	88,000	.....	.....	88,000
West Texas	260,000	.....	.....	452,000
Southwest Texas	193,800	.....	.....	296,150
Texas Gulf Coast	259,000	.....	.....	467,700
Wyoming	89,750	3,500	96,700	95,700
Total United States	3,618,500	339,170	4,803,570	4,481,150
Change from prev. week	down 862,650			

Total production January 1-October 6, 1945 ..... 1,329,753,125 bbl.
Same period last year ..... 1,266,721,920 bbl.

PENBERTHY
SUMP PUMPS



Used wherever seepage water accumulates, the Penberthy Automatic Electric Sump Pump and the Penberthy Automatic Drainer (water or steam operated) have demonstrated their superiority in this service. Simple and rugged design—copper and bronze construction throughout.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

ALTEN
Screw Type
STUFFING BOX
CASING HEAD

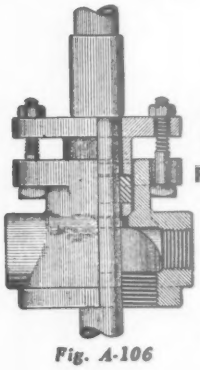


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Fig. A-106

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and lime. In St. Mary Parish, Humble 1 Warren Kearney, second test in the Bayou Carlin area, is drilling ahead at 11,370 ft. in shale and hard sand streaks.

There were 12 new locations reported this week, 2 of which are wildcats, 1 each in St. Landry and Tangipahoa parishes, both scheduled to be drilled to 10,000 ft. The 12 new tests have a total projected depth of 135,600 ft., or an average contract depth of 10,430 ft. All seven completions were in proven areas with Delta Farms leading with two producers.

N. CENTRAL TEXAS

1,836 Bbl. Wildcat Given Montague Co.

WICHITA FALLS.—A. R. Dillard 1 Dr. J. T. Dawson, N. Kimbro Survey, Montague County wildcat 7 miles northwest of Montague, has been completed for 1,836 bbl. of oil in 24 hours through ½-in. choke through perforations at 5,992-6,010 ft. Casing pressure was 1,100 lb. and tubing pressure was 550 lb. Venmex Oil Co. and Aro Equipment Co. 1 Beakley, Block 21, M. Garnett Survey, wildcat 1 mile east of Belcherville, Montague County, drilled conglomerate at 5,553-94 ft. On a 35-minute drill-stem test at 5,605-28 ft. recovery was 45 ft. of mud and 90 ft. of oil and gas-cut mud. There was no bottom-hole pressure. It is drilling below 5,775 ft. in lime.

Helmerich & Payne 1 Liles, Block 291, TE&L Survey, Throckmorton County wildcat 2½ miles southeast of Throckmorton, topped Caddo at 4,272 ft. It was cored from 4,493-4,500 ft. and recovered 2 ft. of lime with stain and odor of oil. Operator is preparing to take a drill-stem test. Ohio Oil Co. 1 L. A. Gibson, Section 484, Block H, W&NW Survey, Childress County wildcat 6 miles southeast of Childress, was drilling below 6,600 ft. in lime and shale.

Electra field, Wichita County, reported seven completions and KMA field, Wichita County, had four. Archer County had 14 field locations, Wichita County 13, and Young County 5.

In West Central Texas, Coleman County had three field completions and Shackelford County two. Jones County reported three new field locations.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: D. H. Bolin 3-A Bill Threat, Sec. 92, Jefferson CSL A-240, 3 mi. NE Anarene, dry, TD 1,973 ft.

L. Eric Jones 1 Virgil Seay, Blk. 63, J. W. Harris Subd., 6 mi. W Archer City, elev. 1,022 ft., dry, TD 1,601 ft.

O. R. Hartt 1 Abercrombie & Taylor, Sec. 2, SPRR Sur. A-1,281, 3 mi. S and 9 mi. W Archer City, dry, TD 1,400 ft.

Denton County: Continental Prod. Co. 1 F. W. Hayden, A. Hernandez Sur. A-615, 5 mi. W and 1 mi. S Pilot Point, elev. 618 ft., Ellenburger 1,933 ft., dry, TD 2,000 ft.

Grayson County: Seitz, Comegys & Seitz and Sohio 1 Geo. Graham, C. E. Findlexan Sur. A-403, 3½ mi. SE Collinsville, Ellenburger 4,216 ft., dry, TD 4,375 ft.

Jack County: Ralph Harper et al 1 A. E. Sewell, Wm. Montry Sur. A-404, 4 mi. S Jacksboro, elev. 1,267 ft., dry, TD 3,360 ft.

Wichita County: C. D. Knight et al 1 N. J. Jacobi, Blk. 246, Waggoner Colony Subd., 3½ mi. N and ½ mi. E Electra, elev. 1,136 ft., dry, TD 2,105 ft.

C. D. Knight 1 Sheldon, Blk. 307, Waggoner County Subd., 4 mi. E and 3½ mi. N Electra, dry, TD 2,105 ft.

Louis Sykes 1 H. C. Obenhaus, MEP&P Sur. A-230, 5 mi. E and 4 mi. N Electra, elev. 1,118 ft., dry, TD 1,975 ft.

CANADIAN FIELDS

Two Turner Valley Outposts Drilling

CHATHAM.—In North Central Turner Valley, Royalite Oil 82, LSD 4, 1-20-3w5, with Madison limestone at 6,237-6,828 ft. has initial production of 146 bbl.

Most interesting tests in Turner Valley are two outpost wells drilled by Home Oil northwest of production. Home Oil 20, LSD 7, 24-21-4w5, is 362 ft. in upper Blairmore at 6,992 ft. and Home 21, LSD 11, same section, ¼ mile north and west, is still in lower Benton at 7,120 ft.

Medicine Hat.—In the Medicine Hat field, southern Alberta, Medicine Hat 71 municipal well, LSD 11, 16-13-6w4, has finished at 1,220 ft. with 1,965,000 cu. ft. initial production.

Prince Edward Island.—Joint deep test of Socony-Vacuum Oil Co., Inc., and Cities Service Co. drilled in Hillsborough Bay, 8 miles offshore from Charlottetown, P.E.I., is dry after establishing a new Canadian drilling record of more than 13,000-ft. depth. This was the only ocean test ever drilled in Canada, the rig being erected on a steel and concrete structure in salt water. The heavy-duty rotary outfit is being shipped to Venezuela. Failing to get oil or gas production, drilling was continued to test an indicated salt bed, which did not prove commercial. The previous Canadian depth record was established by Imperial-Coalspur 1, in the northern Alberta foothills, abandoned by Imperial Oil in August at 12,955 ft.

Junping Pound.—A new deep drilling test is developing in the Jumping Pound field, where Shell Oil Co. 10-14-J, LSD 10, 14-25-5w5, is in upper Blairmore at 10,057 ft. This now exceeds the depth of

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Shell 4-24-J, LSD 4, 24-25-5w5, in the same area which had a wet gas flow with some oil in Madison limestone at 9,947 ft.

SOUTHWEST TEXAS

Agua Prieta Field Is Given New Pay Zone

CORPUS CHRISTI.—A new producing sand for the Agua Prieta field, Duval County, has been opened by Taylor Refining Co. 5-C E. A. Parr, Survey 297, flowing 68 bbl. per day of 47°-gravity oil, through a 7/64-in. choke, no water. Tubing pressure was 405 lb., casing pressure 210 lb. This hole was drilled to 4,987 ft., plugged back and sidetracked to 4,818 ft., and set 5½-in. casing at 4,266 ft. Production was through 48 perforations at 4,200-08 ft. Taylor Refining has staked location for 6-C E. A. Parr in the same survey.

A new gas pool 10 miles west of Refugio in Bee County, has been opened by Sam Chamberlain 1 H. C. Wood. Drilled to a total depth of 5,816 ft., the 5½-in. casing was set at 5,318 ft. This test was completed as a gas well through perforations in sand at 5,230-45 ft., working pressure 2,074 lb., shut-in pressure 2,060 lb. Well is now shut in.

Plymouth Oil Co. 1 Harry Ezzell, wildcat, 6 miles southwest of Calliham, in McMullen County, encountered a shallow gas sand, skidded over approximately 50 ft. and started drilling a new hole.

The South Texas Geological Society has announced the name "Rosalia" has been given the field discovered by Cox & Hamon 3 Clara Driscoll, 13 miles northwest of Benavides, in Section 56, Rosalia Grant, Duval County.

Thirty-nine new locations were reported this week, 16 of which are wildcats, 4 each in Bee and Victoria counties, 2 in Atascosa County, and 1 each in Bastrop, Calhoun, Frio, Hidalgo, Jim Wells, and Jim Hogg counties. Of the 32 completions reported, 8 were wildcats, 2 field openers, 1 oil and 1 gas, both in Bee County, and 1 new oil sand in Duval County. Jim Wells and Starr counties led with five completions each.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Bee County: New oil pool—Tom Graham 1 Theis et al, R. S. Barnes Survey, Abstract 115, 16 mi. NW of Beeville, top sand 3,571 ft., TD 3,587 ft., perforated at 3,573-82 ft., PT 105 bbl. per day through a 3/16-in. choke, tubing pressure 125 lb., no water.

New gas pool: S. Chamberlain 1 H. C. Wood, Jose Maria Castillo Survey, 10 mi. W of Refugio, top sand 5,230 ft., TD 5,816 ft., perforations 5,230-45 ft., tubing pressure 2,074 lb., shutin 2,060 lb. Gas well shut in.

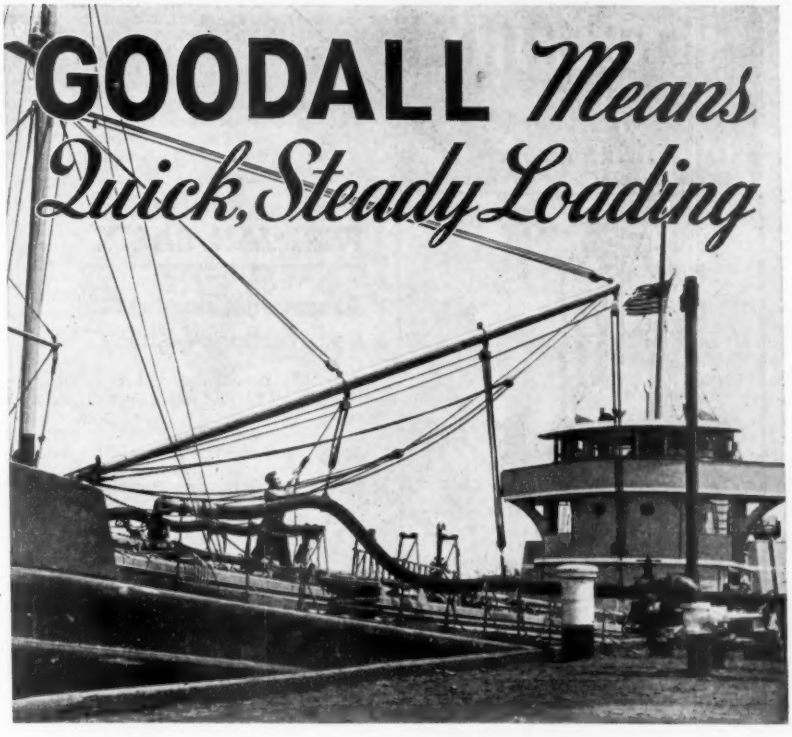
Duval County: New pay in Agua Prieta field—Taylor Refining 5-C E. A. Parr, Survey 297, top sand 4,200 ft., TD 4,987 ft., sidetracked TD 4,818 ft., perforations 4,200-08 ft., PT 68 bbl. per day through a 7/64-in. choke, gas-oil ratio 575 to 1, tubing pressure 450 lb., casing pressure 210 lb., gravity 47°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Goliad County: Santa Clara Oil et al 1 Ida P. Huggins, Maria De Jesus Ybarbo Survey, 3½ mi. E of Goliad, dry at 4,367 ft.

Refugio County: P. R. Rutherford 1 L. Zarsky, Esteban Lopez Survey, Section 13, Johnson & Pugh Subdivision, 2 mi. S of Bonnie View field, dry at 6,510 ft.

Starr County: Billstrom & Armstrong 1



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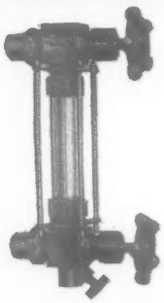

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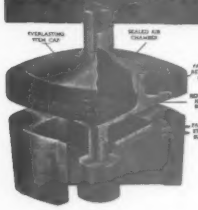

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Mary M. Edgerton, Porcion 80, Share 66, Block 11, 12 mi. NW of Rio Grande City, dry at 1,223 ft.

B. H. Cummings 1 Starr County Cattle Co., Porcion 89, Share 60-0, Block 75, 13 mi. NE of Rio Grande City, dry at 2,854 ft.

Victoria County: Monday Oil 1 Ina Dell York, Jas. Cheevers Survey, Abstract 155, 1 mi. SW of Guadalupe, dry at 5,710 ft.

PERMIAN BASIN

Andrews County Test Recovers Pipe-Line Oil

MIDLAND.—Humble Oil & Refining Co. 1 J. E. Parker, Section 24, Block A-41, Public School Land Survey, ¼ mile south and ¼ mile west of Sun Oil Co. 1 Martin, recent opener of a Clear Fork pool in central Andrews County, flowed oil in the McKee section of the Simpson. On a 90-minute drill-stem test at 8,625-8,808 ft. the wildcat showed gas at the surface in 25 minutes and continued throughout the test. Recovery was 8,500 ft. of pipe-line oil, estimated at 80 bbl. of 33.7°-gravity oil hourly. The Simpson was topped at 8,375 ft. Elevation is 3,335 ft. On a drill-stem test in the Silurian at 7,994-8,167 ft., 180 ft. of mud-cut oil, 360 ft. of free oil and 180 ft. of oil and gas-cut mud was recovered. It showed some oil in the Clear Fork, but no drill-stem test was run. It is drilling below 8,825 ft. Operator plans to drill to the Ellenburger.

Shell Oil Co., Inc., and The Texas Co. 1 Ratliff & Bedford, Section 4, Block 73, Public School Land Survey, discovery in southwestern Andrews County to be dually completed in the Devonian and Ellenburger, flowed 829 bbl. of 42.9-gravity oil in 18 hours in the Devonian at 8,850-9,150 ft. The well flowed 96 bbl. of oil hourly in the Ellenburger at 10,018-320 ft. Stanolind Oil & Gas Co. 1-BB University, Section 17, Block 11, University Lands, southeast offset to the discovery of the Three Bar pool of southwestern Andrews County, ran a 60-minute drill-stem test at 7,630-7,717 ft. and recovered 160 ft. of drilling mud with some free oil on top. It is to core ahead after making repairs. Humble 88-X Means, Section 9, Block A-35, Public School Land Survey, deep test in the Means pool of northeastern Andrews County, is drilling below 13,779 ft. in lime unchanged.

Amerada Petroleum Corp. 1-A Dr. E. H. Jones, Section 3, Block A-6, Public School Land Survey, discovery 7 miles northwest of the Russell pool, Gaines County, flowed 543.72 bbl. of 42.5-gravity oil in 21 hours at 11,228-284 ft. On a later test at 11,181-284 ft. the discovery swabbed and flowed 298 bbl. of fluid in 12 hours, cut 2 per cent basic sediment and 6 per cent acid water. Operator is still testing. Amerada has staked 1-C Jones, ½ mile south and ½ mile east of the discovery.

Fullerton field, Andrews County, had five completions this week. Waddell field, Crane County four, and Keystone-Ellenburger field, Winkler County and Slaughter field, Hockley and Cochran counties, each had three. Slaughter field, Cochran County, and Anton field, Lamb County, each reported two new locations.

WEST TEXAS SUCCESSFUL WILDCAT

Pecos County: New oil pool—R. G. Patillo 1 Thornton Davis, Sec. 105, Blk. 8, H&GN Sur., 5 mi. NW Pecos Valley, elev. 2,468 ft., flowed 70 bbl. day, perf. 1,559-68 ft. Yates, gravity 21.4°, TD 1,568 ft.

WEST TEXAS WILDCAT FAILURES

Borden County: Texas 1 J. A. Phillips, Sec. 2, Blk. 32, T-3-N, T&P Sur., 12 mi. SW Gail, elev. 2,440 ft., Yates 1,530 ft., San Andres 2,730 ft., dry, TD 3,363 ft.

Pecos County: R. M. Payne 1 H. C. McLain, Sec. 7, Blk. 2, H&TC Sur., 1½ mi. W Palisade, elev. 2,363 ft., Waddell 5,060 ft., Ellenburger 5,195 ft., dry, TD 5,322 ft.

PANHANDLE

AMARILLO.—The Texas Co. 1 Capitol Freehold Land Trust, Tract 10, Block B-7, Capitol Lands Survey, wildcat 9 miles south of Texline, Dallam County, is dry at 6,169 ft. in granite, topped at 6,162 ft.

SOUTHEASTERN NEW MEXICO

HOBBS. — Continental Oil Co. 1-B-22 Skaggs, 22-20s-37e, ½-mile northwest extension to the Skaggs pool of southeastern Lea County, swabbed and flowed 67 bbl. of oil in 6 hours at 7,667 ft. It was drilled to 7,730 ft. in lime and is preparing to test. Olson Oil Co. and Blount Drilling Co. 1 State, 29-11s-32e, wildcat 6 miles north of the Caprock field, Lea County, reported showing of gas at 4,172 ft. and was coring below 4,180 ft. in lime. Elevation is 4,414 ft. Phillips Petroleum Corp. 1 Sims, 24-22s-37e, on the north side of the Drinkard area, was swabbing a slight showing of oil and gas at plugged-back depth of 5,269 ft.

Eddy County reported three field completions this week and Lea County two. Lea County had three new field locations and Eddy County two.

SOUTHEASTERN NEW MEXICO SUCCESSFUL WILDCATS

Lea County: New oil pool—C. T. McLaughlin and Cosden Pet. 1 State, 2-17s-32e, 2 mi. N Maljamar pool, elev. 4,190 ft., pumped 125 bbl. day through 2-in. tubing, perf. 4,094-4,385 ft. San Andres, gravity 37.2°, TD 4,419 ft. New oil pay: Neville G. Penrose, Inc. 1

ST. LOUIS SNAPSHOTS

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Penrose, 9-22s-37e, 2 mi. SE Eunice, Penrose field, elev. 3,429 ft., Ellenburger 7,950 ft., flowed 667 bbl. day through ½-in. choke on 2-in. tubing, perf. 8,059-89 ft. and 8,100-40 ft., gravity 40.6°, gas-oil ratio 1,100, TD 8,370 ft.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Lea County: Mac T. Anderson and C. B. Buck 1 State, 21-21s-33e, 3 mi. SW North Lynch pool, elev. 3,767 ft., dry in Yates, TD 3,752 ft.

MICHIGAN

Record Week for Both Completions and Failures

SAGINAW.—It was a poor record week for the year in Michigan oil and gas fields; a record for completions—26; a record for dry holes—22; a record for wildcat dry-hole completions—16, and for new locations—30. Initial potential for the four producers was slightly under 3,300 bbl. a day, including a 100-bbl.-per-hour well in Arenac-Deep River, a 750-bbl.-a-day completion in Coldwater-Isabella, and smaller wells in Fillmore-Allegan and Monitor-Bay.

Two failures dampened hopes for southeast extension of the Coldwater field as the Smith 1 Norfleet in Section 33 was dry in the Dundee as was Sohio Petroleum Corp. 1 Cheadle.

Offset tests have been started in Section 1 of Douglas Township, Montcalm County, where the Union-Barber Gyger discovery continues steady pinched-in production of 175 bbl. a day. Sohio is drilling a west offset, Leslie T. Barber and Union Drilling Co. have a second well started on the discovery lease. Sun Oil Co. plans an east offset and Sohio plans others north and south.

Eleven of the week's new locations are in Isabella County, six in Arenac, two each in Mecosta, Kent and Montcalm, one each in Kalamazoo, Ionia, Clare, Ottawa, Van Buren, Allegan and Osceola. Sohio obtained eight of the permits issued by the state conservation department. All six new Arenac locations are in Deep River Township.

MICHIGAN WILDCAT FAILURES

Allegan County, Cheshire Township: P. F. Broughton 1 Tony Walker, NE NW NE 32-1n-14w, dry in Traverse limestone, TD 1,230 ft.

Throwbridge Township: Alan W. Winchester 1 F. W. Gillespie, SE SW NW 2-1n-13w, dry in Traverse limestone, TD 1,413 ft.

Valley Township: S. L. McCall 1 David J. Clark, SE NE NW 1-2n-14w, dry in Rainbo formation, TD 1,561 ft.

Arenac County, Arenac Township: Raymond M. Whyte 1 McSpadin & Russell, NE NW NW 34-19n-5e, dry in Dundee, TD 3,150 ft.

Deep River Township: M. E. Holloway 1 Annis Lesney Badge, NW NW SE 23-19n-4e, dry, TD 4,205 ft.

Lowell Bernhardt 1 Anthony Logas, SW NW NW Sec. 25, dry in Dundee, TD 2,810 ft.

Turner Township: Frank E. Roush 1 State of Michigan, SE SE SE 21-20n-6e, dry in Dundee, TD 3,052 ft.

Michigan Oil Co. 1 John Dewald, SE SE NW Sec. 25, dry in Dundee, TD 3,206 ft.

Huron County, Dwight Township: Charles W. Teater 1 Valentine Watchowski, S½ NE SE 21-18n-13e, dry in Dundee, TD 2,940 ft.

Ionia County, Orleans Township: S. J. Higelmire 1 Ray Emery, SW NE SW 1-8n-7w, dry in Dundee, TD 3,135 ft.

Kent County, Solon Township: P. F. Broughton 1 Beryl Austin, NW SE SW 11-10n-11w, dry in Traverse limestone, TD 2,563 ft.

Midland County, Ingersol Township: Allegan Pipe & Supply Co. 1 Marriman, NE SE NE 24-13n-2e, dry in Rainbo formation, TD 3,642 ft.

Missaukee County, Reeder Township: R. A. T. Wright 1 Sadie Weidler, W½ NW SE 34-22n-7w, dry in Dundee, TD 4,108 ft.

Newaygo County, Barton Township: Michigan Consolidated Gas Co. 1 Cora Stockwell, NW 30-16n-11w, dry, TD 1,194 ft.

Denver Township: Sohio Petroleum Co. 1 Angelo Hills, NW SE SW 26-14n-14w, dry in Traverse limestone, TD 2,322 ft.

Washtenaw County, Sylvan Township: C. W. Collin 1 Albert Hinderer, NW NW NW 36-2s-3e, dry in Traverse limestone, TD 1,290 ft.

APPALACHIAN FIELD

Jackson County Test Gaging Gas From Lime

PITTSBURGH.—In Ravenswood district, Jackson County, West Virginia, Columbian Carbon Co. is drilling through the Oriskany sand in the test 804 Delbert O. Cole with a gage of 564,000 cu. ft. gas at 4,930 ft. with the Corniferous lime topped at 4,818 ft., Oriskany 4,927 ft.

In Bell Township, Clearfield County, Pennsylvania, F. C. Deemer is drilling at 4,878 ft. in the deep test on Alice Irvin farm.

In Kanawha County, United Fuel Gas Co. topped the Corniferous lime at 4,802

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ft. in 5,668 Edward Gebhart in Elk district where there has been renewed Oriskany drilling due to the test on this tract which was good for 10,000,000 cu. ft. of gas.

In Tucker County, the rotary test of Ohio Oil Co. on Kuykendall unit in Dry Fork district reached 8,375 ft. or 125 ft. below the top of the Oriskany sand and shut down with a fishing job. In Williamsburg district, Greenbrier County, this company is try to case off water at 1,975 ft. in the wildcat on Gauley Coal Land Co.

Completions during the week were unimportant. New locations in Pennsylvania totaled 7, scattered in Armstrong, Clarion, Fayette, Green and Indiana counties. In West Virginia, there were 10 new locations widely separated in Brooke, Cabell, Calhoun, Jackson, Logan, Putnam, Roane and Wood counties.

ROCKY MOUNTAIN

Weld Co., Colo., Test In Critical Stages

DENVER.—Several of the widely scattered wildcats in the Rocky Mountain area came in for special attention during the week, although none revealed any outstanding results. Tide Water Associated Oil Co. 1 Weld County-7, NW SW SW 1-3n-61w, Wiggins District, Weld County, Colo., joint with the Ohio Oil Co., is at a critical stage. It had a good show of oil in the Muddy sand at 6,409-27 ft., and on a drill-stem test yielded some oil and gas-cut mud, but lacked pressure. The Dakota was topped at 6,470 ft., and 20 ft. of core recovered showed some oil and gas in the top few feet followed by water. The Lakota and Sundance will be drilled before making further test of the Muddy sand.

Record well abandoned.—Superior Oil Co. and Alder Oil Co. 1 Miller, SW SW NW 36-8s-91w, Divide Creek, Mesa County, Colorado, which holds the depth record for the Rocky Mountain area, was abandoned at 11,942 ft. All sands were hard and tight and yielded no oil or gas shows. It was originally drilled to 10,815 ft. as a joint operation of the Continental Oil Co., Amerada Oil Co. and California Oil Co. Tops encountered below that depth were Dakota, 11,200 ft.; Morrison, 11,359 ft., Entrada, 11,820 ft.

Pure Oil River Dome test.—Pure Oil Co. 1 Unit, NE NE NW 18-48n-92w, Washakie County, Wyoming, which showed gas under heavy pressure with distillate in the upper Frontier sands, cored more sand at 7,270-30 ft. with gas saturation down to shale breaks in the lower part, but no drill-stem test was attempted due to the danger of a blowout. It is coring ahead at 7,475 ft. and probably will run a protective string of 9⅝-in. before making any more tests.

Wilson Creek extended.—Texas Co.-California Co. 28 Unit, SW NE NW 2-2n-94w, Wilson Creek, Rio Blanco County, Colorado, was completed in the Morrison at 6,564-88 ft. after plugging back from the Sundance at a total depth of 6,683 ft. It swabbed 50 bbl. of oil and 160 bbl. of mud and water, indicating an edge well on the southeastern flank. It is ¼ mile out from the nearest producer.

Sheldon Dome operation.—Carter Oil Co. has made a location for 1 Wind River, SE NE 16-5n-2w, on the Sheldon Dome, Fremont County, a south offset to the Kerlyn Oil Co.-Phillips Petroleum Co.-Carter discovery well. It is a 100 per cent Carter operation. The discovery was opened for a test last week following the installation of tankage and flowed 35 bbl. of oil in 35 minutes through open tubing. The oil, which tests 36.2° gravity at 70°, is coming from the Embar.

New operations.—Ten new operations were reported in the Rocky Mountain area, of which five are in Wyoming, three in Colorado, and two in Montana. The Colorado wells are all in the Rangely field. The Wyoming locations are one each in the Sheldon, Bailey, Cole Creek, Rex Lake and Rock River fields. Montana had one each in Cut Bank and Kevin-Sunburst.

Of the above only one is strictly a wildcat, Wasatch Refining Co. 2 Coughlin, SE NW 26-16n-77w, Rex Lake field, Carbon County, which has produced from the Dakota and Sundance sands but which has never been tested in the Embar-Tensleep series. New location is southeast of the producing area.

Completions.—Nine wells were completed of which four were in Colorado, three in Wyoming and two in Montana. Six of these were oil wells with an initial production of 1,224 bbl. Three were wildcats, all dry.

COLORADO WILDCAT FAILURE

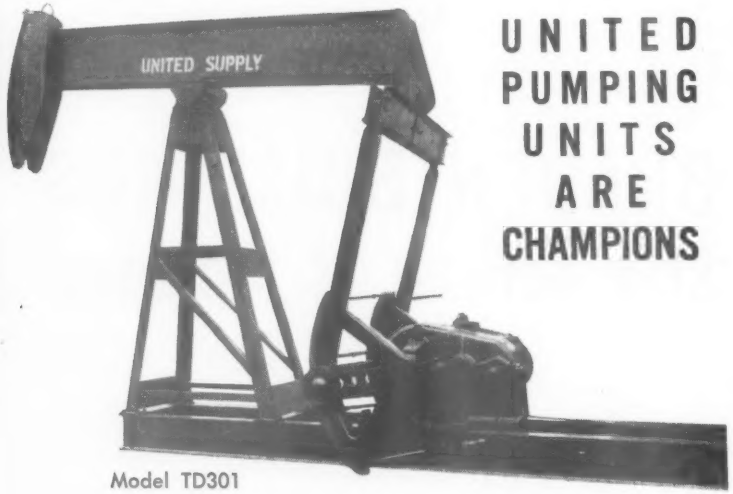
Mesa County, Divide Creek: Superior Oil-Alder Oil 1 Miller, SW SW NW 36-8s-91w, TD 11,942 ft., dry, old well drilled deeper from 10,815 ft., top Dakota 11,200 ft., top Morrison, 11,359 ft., top Entrada (Sundance) 11,820 ft., all sands hard and tight, no oil or gas shows.

WYOMING WILDCAT FAILURE

Converse County, Big Muddy: Gem Oil 1 Gardner, SW SE 6-33n-76w, TD 4,584 ft., water in Lakota, dry.

MONTANA WILDCAT FAILURE

Toole County, Barthelote: Hardrock Oil 1 State, SW SW NE 36-36n-1e, TD 2,504 ft., top of Madison 2,504 ft., 2,500 ft. sulfur water, dry.



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Over All Gear Ratio	25.5
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LA.-ARK.

Delhi Well Flowing 273 Bbl. Per Day

SHREVEPORT.—The Delhi pool of Richland Parish is getting another oil well with the near completion of Vaughey and Vaughey 1 Gulledge estate, 26-17n-9e. After drilling to a total depth of 3,423 ft., perforations were made at 3,403-13 ft., and the well flowed 273 bbl. of oil per day. This will make the 40th oiler to be completed in this field since its discovery in 1944.

Completions in North Louisiana this week yielded only one oil well, three gas wells, and five dry holes, two of which were wildcats. Locations announced total 20, including 7 wildcats, 2 of which are to be drilled in Madison Parish, and the others scheduled 1 each for Caddo, East Carroll, DeSoto, Morehouse, and Natchitoches parishes.

In the Arkansas fields, Stephens and Hillsboro fields each got one oil well in the completions, and two dry holes were completed, one a wildcat. There are five new starts scheduled this week, including one wildcat to be drilled in Ouachita County.

ARKANSAS WILDCAT FAILURE

Calhoun County: J. T. O'Neil 2 Gaughan, NW SE NW 22-14s-16w, dry, TD 4,510 ft.

NORTH LOUISIANA WILDCAT FAILURES

DeSoto Parish: E. F. Neely and W. C. Feazel 1 Lafitte Co., NW SE 24-14n-12w, dry, TD 1,741 ft.

H. R. Randall 1 Simmons-Federal Land Bank, 1,980 ft. south and 660 ft. west of NE corner of 36-15n-15w, dry, TD 3,312 ft.

KANSAS

Eldorado Outpost Well Has 2,400-Ft. Fill Up

ED ADAIR 1 Eaton, NW NW SE 22-26-7e, a wildcat just west of the Eldorado pool of Butler County, will probably extend the pool. The Mississippi lime was topped at 2,565 ft., casing was set, and the well drilled in to 2,590 ft. In five hours, oil had risen in the hole 2,400 ft.

Cowley County.—B. B. Blair 1 Waldschmidt, NW NW SW 5-34-6e, wildcat, is swabbing three bbl. of oil per hour. After drilling to a total depth of 2,835 ft., and cutting the Bartlesville at 2,870 ft., 5-in. pipe was set at 2,855 ft. Operators then started swabbing. This well is just southwest of the Esch gas field.

Kingman County.—Lion Oil Co. 1 McMichael, SW SW NE 13-27-10w, possible discovery well, is running survey after drilling to a total depth of 4,500 ft. A drill-stem test, taken in the Viola at 4,285-92 ft., recovered 40 ft. of oil and 100 ft. of mud. Operators drilled through the Simpson shale and Simpson sand, and a drill-stem test taken in the Simpson recovered only mud.

Pawnee County.—Huber Oil Co. 1 Katchelman, NW NW SW 34-22-16w, recent discovery, is rigging up cable tools to drill deeper. The well swabbed 28 bbl. oil in 6 hours from the Arbuckle after acid.

Completions for the week totaled 40, including 16 oilers, 1 a wildcat; 11 gas wells, and 13 dry holes, of which 6 were wildcats. The Hugoton gas field took the honors for the week with the 11 gas wells and 1 dry hole being completed.

KANSAS SUCCESSFUL WILDCAT

Butler County: New Oil Pool—K. T. Weideman 1 Hoard, NE SW NE 28-29-8e, pumped 25 bbl. from Mississippi at 2,812-2,844 ft., TD 2,844 ft., Mississippi 2,808 ft.

KANSAS WILDCAT FAILURES

DeCatur County: Continental 1 Brown, NE NE NE 33-3-27w, dry, TD 3,982 ft., Arbuckle 3,923 ft.

Dickinson County: Transwestern 1 White, SE SE SE 14-14-3e, dry, TD 3,037 ft., Arbuckle 3,024 ft.

Edwards County: Cities Service 1 Minet estate, SE SE NE 15-25-17w, dry, TD 4,885 ft., Arbuckle 4,855 ft.

Phillips County: Tom Allen et al 1 Schorer, SE NE NE 33-5-19w, dry, TD 3,590 ft., Arbuckle 3,564 ft.

Saline County: California 1 Juleps, NE NE NE 30-15-1w, dry, TD 2,695 ft., Burlington 2,687 ft.

Sheridan County: Continental 34-strat Hardesty, NE NE SW 18-6-26w, dry, TD 4,163 ft., Arbuckle 4,138 ft.

MISSOURI WILDCAT FAILURE

Stoddard County: M. H. Marr 1 Barnett, SW SW 3-25n-11e, dry, TD 4,580 ft., Quartz 4,572 ft.

OKLAHOMA

Pure's Panhandle Oil Well Week's Feature

THE most interesting well of the past week in Oklahoma was Pure Oil Co. 1 Oklahoma State Land, SE SE NW 7-5n-8e (Cimarron Meridian), Cimarron County, the most northwesterly county in the state. It flowed by heads from 90 to 100 bbl. of oil per day from basal Pennsylvanian sand which had been shot with 40 qt. at 4,824-44 ft. It was the first substantial showing of oil recorded in the three-county Panhandle area and is about 100 miles from other oil production. Details of the oil discovery and other information concerning the wells on the 90,000-acre block of the Pure Oil Co. will be found in the Week's Highlights on page 161.

About 20 years ago Ramsey Petroleum Co. drilled a well near Boise City in Cimarron County, about 12 miles from the Pure's oil well. It showed enough oil to fill the pits but the rig was destroyed by fire. Two other wells drilled in the same area were dry.

It was a week of unimportant new wells for the most part, but a number of wildcats, which had been closely watched, were finished as failures. Some other wildcat tests were at interesting depths.

Olson Drilling Co. et al 1 Gowey, NE NE SW 7-28n-5e, Kay County, north of the topmost limits of the Burbank field, which had been drilled with the hope that the Burbank sand would be found productive that far north, was dry at 3,212 ft., 12 ft. below the contract depth.

The Texas Co. 1 Stephens, SW SW NE 3-3n-10w, on the east flank of the Fort Reno structure in Comanche County, was called a dry hole at 7,201 ft.

Shell Oil Co., Inc., 1 Wantland, C NE NE 6-9n-2w, Cleveland County, a wildcat, was a dry hole, but it was a "mystery" well, and the total depth was withheld.

Another wildcat failure was J. E. Trigg 1 Tennery, C NE SW 22-13n-7w, Canadian County, which was given up at 10,731 ft. First Wilcox sand was topped at 10,415 ft. and second Wilcox at 10,630 ft., both figures being unofficial.

Magnolia Petroleum Co. was drilling at 7,230 ft. in 1 Britt unit, SE NW SW 3-4n-6w, Grady County. Hogshooter sand was topped at 6,900 ft.

Carter Oil Co. 1 Hawkins, C NE NE 34-6n-3w, McClain County, 9½ miles southeast of the Washington pool, was drilling ahead after testing Deese sand at 7,847-51 ft. and coring to 7,861 ft., finding stains and a 2½-ft. bleeding section.

Skelly Oil Co. 1 Mayer, C SE SE NW 33-1n-10e, Coal County, made a drill-stem test at 3,720-36 ft., recovering 50,000 cu. ft. of gas and 60 ft. of drilling mud in 40 minutes. It was drilling at 3,860 ft.

OKLAHOMA SUCCESSFUL WILDCAT

Okfuskee County: New Oil Pool—Wood Oil 1 Smith, SE SW NE 23-12n-10e, flowed 115 bbl. of 29.8-gravity oil from Booch at 2,488-2,518 ft., TD 2,518 ft., Booch 2,488 ft.

OKLAHOMA WILDCAT FAILURES

Beckham County: A. R. Jordan 1 Caudill, SE NW NW 35-9n-25w, dry, TD 3,104 ft., Granite wash 3,040 ft.

Lincoln County: Ashland 1 Reel, NW NW NE 24-12n-5e, dry, TD 4,727 ft., Wilcox 4,719 ft.

Logan County: Olson Drilling et al 1 Nance, SW NW 26-17n-2w, dry, TD 5,951 ft., second Wilcox 5,920 ft.

Major County: H. L. Hunt 1 Clark, SE NE SW 32-22n-14w, dry, TD 9,345 ft., Wilcox 9,208 ft.

Marshall County: Magnolia 1 Neff, SW SE NW 25-5s-5e, dry, TD 5,510 ft., McLish 5,470 ft.

Oklahoma County: Harper-Turner et al 1 Whitt, NE NE NE 24-12n-2w, dry, TD 6,462 ft., Sylvan 6,444 ft.

Stephens County: Stoner et al 1 Miller, SE NW NE 20-2s-8w, dry, TD 2,880 ft.

MISSISSIPPI

Gwinville Well Flows 78 Bbl. Oil Per Day

JACKSON.—Humble Oil & Refining Co. 1 Denkmann Lumber Co., NW SE 27-9n-19w, in the Gwinville pool of Jeff Davis County, flowed 78 bbl. of oil per day from total depth of 9,400 ft. Humble has been testing for some time, perforating and squeezing to shut off salt water. Previous to the well's flowing oil, running the swab twice started the well flowing 1,160,000 cu. ft. of gas with a trace of 49-gravity fluid, from perforations at 8,257-60 ft. The oil is coming from the Massive sand, topped at 9,244 ft.

Cranfield pool had the only successful completion for the week, out of a total of seven. Five of the six dry holes were wildcat tries.

MISSISSIPPI WILDCAT FAILURES

Smith County: Gulf Refining 1 Grissom-Ainsworth, approx. NE NE NE 21-10n-14w, dry, TD 8,492 ft., Comanche 8,277 ft.

Warren County: National Associated Petroleum 1-A Davis heirs, 2,460 ft. south and 870 ft. west of SE corner of accretion to Section 23-14n-1e, dry, TD 7,556 ft., Comanche 7,545 ft.

Wayne County: Humble D-1 G. M. & O. Railway, 1,980 ft. north and 657 ft. east of SW corner of 23-7n-7w, dry, TD 8,570 ft., Comanche 7,550 ft.

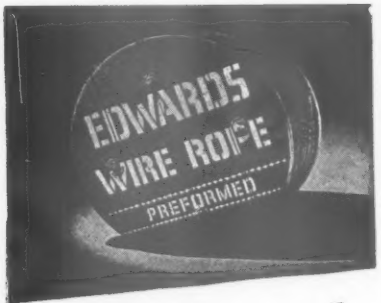
Humble E-1 G. M. & O. Railway, approx. NE NE NE 30-9n-7w, dry, TD 8,512 ft., Comanche 7,370 ft.

Humble 1 U.S.A., NW SE 23-7n-9w, dry, TD 8,505 ft., Massive sand 8,336 ft.

FLORIDA WILDCAT FAILURE

Calhoun County: Pure 2 International Paper Co., 1,381 ft. north and 2,471 ft. east of SW corner of 31-1s-10w, dry, TD 4,022 ft.

XUM



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Among the

Drilling Contractors

Lupher Drilling Co. has the contract for two wildcats to be drilled for Sohio Petroleum Co. in Isabella County, Michigan. They are 1 Vodicka et al, SE SE SE 17-14n-3w, and 1 Brasington, SE NW SW 25-16n-5w.

Can-Tex Drilling Co., of Calgary, Alta., has completed drilling of Princess-C.P.R. 18-22-A, LSD 16, 22-20-12w4 in the Steveville-Princess field, southern Alberta, for California-Standard. The well is testing at 3,961 ft.

Kingwood Oil Co. is moving in rig to drill the Frontier Oil Refining Corp. 1 Martin, NW NW 1-16n-5e, a wildcat in Warren County, Mississippi.

K. de K. Drilling Co. of Vermilion, Alta., has finished drilling El Lee 2, LSD 2, 13-49-1w4 in the Lloydminster field, eastern Alberta. Test finished and cemented at 1,923 ft.

Standard Oil Co. of New Jersey has taken drilling equipment into the Abermarle Sound area of eastern North Carolina, and plans to start operations at an early date.

Fleet Drilling Co., Ada, Okla., will start work immediately on the Erle P. Halliburton, Inc., 1 Howell, SE SE SE 23-1n-7w, another deep test for Stephens County, Oklahoma. The contract is for 7,500 ft.

Gordon Oil Co. has the contract to drill the Ervin Major 3 Nezwiska, SE NE SW 15-19n-4e, in the Deep River field of Arenac County, Michigan.

American Drilling Co. is the contractor for the Michigan Oil Co. 1 Szostak, NE SW SW 28-19n-4e, a wildcat in Arenac County, Michigan.

Voorhees & Good will drill the J. E. Bauer 3 Post et al, NW NW SE 15-19n-4e, Deep River field, Arenac County, Michigan.

Ace Gutowsky has the contract to drill the S. M. Stauffer 1 Hall, NE NE SE 9-25n-7w, Grant County, Oklahoma.

Taggart Brothers and Union Drilling Co. are contractors for the Ranch Oil Co. 2 Thompson et al, NW SE SE 13-18n-5w, in the Harrison pool of Clare County, Michigan.

Big Chief Drilling Co., Oklahoma City, is the contractor for Vickers Petroleum Co. and Globe Oil Co. 1 Gibson, SE NE 30-3n-2w, a 9,000-ft. test southwest of Antioch in Garvin County, Oklahoma.

Merrill Drilling Co. will drill the J. V. Wicklund Development Co. 1 Lueder, SE SW NW 13-14n-6w, a Broomfield well in Isabella County, Michigan.

R. & S. Drilling Co. has the contract for three Sohio Petroleum Co. wells to be drilled in the Coldwater field of Isabella County, Michigan. They are numbers 5, 7, and 8 Gas Unit Commission in Sections 29 and 33 of 16n-6w.

National Drilling Co., of Calgary, Alta., have spudded National-Empire

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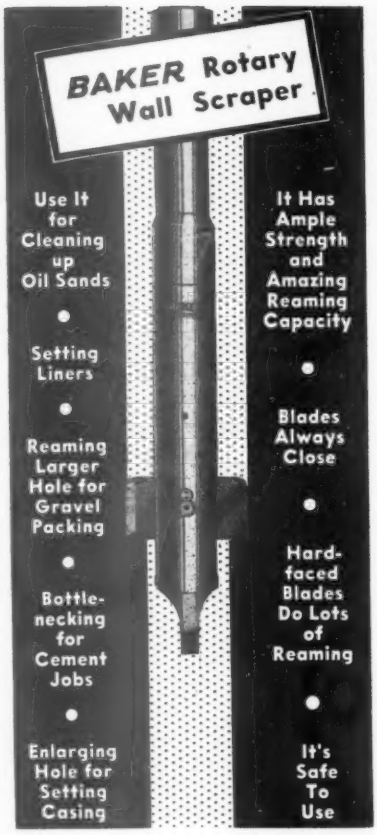
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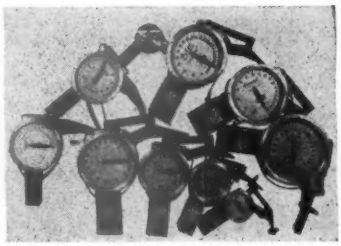

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1, LSD 10, 34-19-12w4, in the Steveville-Princess field, eastern Alberta. This is being drilled under contract as a joint test for National Petroleums and Empire Petroleums of Calgary.

Newell & Chandler, of Calgary, Alta., have the contract for an important exploratory test for New Ranchmen's Oil Co. and Homestead Oil, both of Calgary, in the Steveville-Princess field, eastern Alberta. The test, known as Homestead-Ranchmen 1, is located in LSD 15, 36-21-14w4, in an outlying area where tests by Toronto Syndicate got oil and gas showings.

General Petroleums, of Calgary, Alta., have the contract for Continental Oil Co. 1, LSD 8, 4-21-3w5, in North Turner Valley. The test, on the east flank of the structure, spudded recently.

Spartan Drilling Co. has staked a location to drill their 2 Southern Advance Co., SE SE NW 27-15s-18w, in Ouachita County, Arkansas. This well will be in the new field discovered recently by the McAlester Fuel Co. 1 Wesson.

CALENDAR

October

I.P.A.A., annual membership meeting Tulsa, October 14-17.

American Gas Association, annual meeting, Engineering Societies Building, New York, October 24-25.

November

American Petroleum Institute, annual meeting, Stevens Hotel, Chicago, November 12-15.

Independent Natural Gas Association of America, annual membership meeting. Dallas, November 26.

December

Michigan Oil and Gas Association, annual meeting, Mt. Pleasant, December 3.

(1946)

February

Iron and Steel and Institute of Metals divisions, American Institute of Mining and Metallurgical Engineers, national meeting, Statler Hotel, Cleveland, February 4-8.

American Society for Metals, annual convention (postponed from 1945), Statler Hotel, Cleveland, February 4-8.

American Welding Society, national meeting, Hotel Cleveland, Cleveland, February 4-7.

Exposition of Chemical Industries, twentieth exposition, Grand Central Palace, New York, February 25-March 2.

April

American Association of Petroleum Geologists, annual meeting, Stevens Hotel, Chicago, April 2-4.

Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas, April 17-19.

May

National Association of Corrosion Engineers, annual meeting, President Hotel, Kansas City, Mo., May 7-9.

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PERSONALS

Chief Chemist of New Texas Co. Laboratory

WILLIAM W. ROBINSON, JR., who has been named chief chemist of the new technical service and research laboratory established by The Texas Co.'s Pacific Coast division, producing department, entered the oil industry in 1923 as a chemist with Chanslor - Canfield - Midway Oil Co. at Torrance, Calif. In 1926 he was made chief chemist of California Petroleum Corp.'s natural-gasoline laboratory, which became a part of The Texas Co. in 1928. In 1931 he became director of gas research for The Texas Co.'s Beacon research laboratory, returning to California in 1933 to resume his former post in the gasoline division, which post he held up to the recent change.

Robinson is a member of American Institute of Chemical Engineers, past president of California Natural Gasoline Association, and a member of the California district section of the A.P.I. central committee on drilling and production practice.

The new laboratory will conduct technical service and research activities connected with the drilling and production of petroleum and the processing of natural gas.

Louis I. Mistrot, who was assistant district director of the natural-gas and natural-gasoline division of District 3, Petroleum Administration for War, has joined C. J. Brown and associates, independent oil operators of Houston, as general superintendent. Mistrot, who majored in petroleum engineering at Louisiana State University and University of Oklahoma, was formerly district engineer for Arkansas Fuel Oil Co., Shreveport.

Dr. F. M. Van Tuyl, head of the geological engineering department of Colorado School of Mines, has been given a 2-month leave of absence to go to Sao Paulo, Brazil, where he will act in an advisory capacity for a group of Brazilian industrialists planning a long-term exploratory program for the development of that country's oil resources.

R. H. Jenney has resigned as superintendent of gas measurement for Kentucky-West Virginia Gas Co., Ashland, Ky., to become director and chief consultant for Measurement & Control Service, recently organized at Louisville. Educated at Polytechnic Institute, Jenney has had 18 years' experience in gas measurement and allied operations, and has done work in the extension departments of several universities in petroleum and mechanical engineering.

Norman D. FitzGerald, formerly director of the oil and gas division of Great Lakes Carbon Corp. in New York, has moved to Abilene, Tex., where he is an independent operator and consultant, doing geological work and drilling exploratory wells.

J. B. MACAULEY

John B. Macauley, for the past 2 years chief of applied research for Pratt & Whitney Aircraft, has been named director of engineering research for Ethyl Corp., succeeding **Earl Bartholomew,** who has been made general manager of research laboratories. For 20 years Macauley was with Chrysler Corp., most of that time chief of the engine laboratory. From 1941 to 1944 he was chairman of the war advisory committee of Coordinating Research Council. Bartholomew, who joined Ethyl Corp. in 1926, became director of engineering research the next year.

L. E. HARMON

Laban E. Harmon, since 1931 assistant secretary of Standard Oil Co. (Indiana), was elected secretary last week to succeed **Felix T. Graham,** who is retiring owing to ill health. Following an education in engineering and accounting, Harmon spent the first 9 years of his business career with Prairie Oil & Gas Co. In 1922 he joined Indiana Standard as an accountant and was promoted to positions of executive responsibility.

Edgar D. Cahill, geologist for Skelly Oil Co., has been transferred from Evansville, Ind., to Guymon, Okla.

Ray C. Lewis, formerly district geologist for Stanolind Oil & Gas Co., has been made chief geologist for Houston Oil Co. of Texas. Lewis is a graduate of University of California, where he majored in engineering and geology. He had been in Stanolind's service since January 1, 1934, starting as a roustabout, later working as a scout, then geologist.

William R. Boyd, III, recently released from the U. S. Army, in which he was a lieutenant colonel, has joined Petroleum Advisers, Inc., the management and technical coordinating unit for petroleum operating subsidiaries of Cities Service Co. Colonel Boyd, a son of **William R. Boyd, Jr.,** president of American Petroleum Institute, was with Sinclair Refining Co. before the war, serving as assistant district manager of the Southwest area. In military service he held a key post in the

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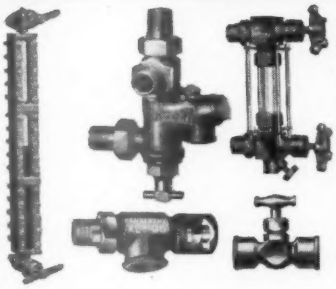

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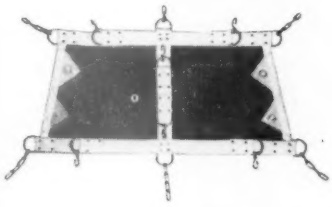

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petroleum section of the Air Service Command. He majored in chemistry and geology at Princeton University.

Carleton J. Everett has left Petroleum Administration for War, District 1, where he was director of refining, to return to Standard Oil Co. of New Jersey as assistant manager of supply. Everett joined PAW in 1943, after 15 years in the industry. From 1935 to 1943 he was domestic production coordinator for his company, and for 2 years he served as executive secretary of the refining committee of Petroleum Industry War Council. In his District 1 office, Everett was largely responsible for the high average output record of 730,000 bbl. per day achieved in the East.

Hervey M. Amsler, vice president Richrock Royalty Co., and **Ardon B. Judd,** vice president Republic Supply Co., both of Houston, and **Robert K. Hanger,** Fort Worth attorney, are new directors of Tennessee Gas & Transmission Co.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, 25, D. C. Notice is hereby given that sealed bids will be received until noon on October 29, 1945 for land described herein, situated within the known geologic structure of the Big Muddy Field, Wyoming. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U. S. C. sec. 226) in the following parcels, all in T. 33 N., R. 77 W., 6th P. M.; Parcel No. 1, sec. 12, SE¼NE¼, 40 acres. Parcel No. 2, sec. 12, SW¼, 160 acres. Parcel No. 3, sec. 13, NE¼, 160 acres. Parcel No. 4, sec. 13, NW¼, 160 acres. Total 520 acres. Bids must be submitted on each parcel separately; but if two or more parcels are awarded to the same bidder, they may be included in a single lease. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked, "Bid for Parcel No. . . ., Big Muddy Field, Wyoming. Not to be opened before noon, October 29, 1945." No bids received after the hour fixed herein for the opening of bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

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ILLINOIS

Three Wildcat Tests Come In as Producers

MATTOON.—J. J. Lynn and Pure Oil 1 William Farris-A, NE NE SW 24-3n-7e, located less than 2 miles from the Sailor Springs pool, in one direction, and the Clay City field in another direction, opened a new productive spot in Clay County with an 888-bbl. initial production, flowing naturally from McClosky lime at 3,028-33 ft., total depth 3,036 ft.

Two other wildcats came in as producers, one opening a pool in Section 29-2n-2w, Clinton County, the other extending the Samsville pool in Richland County.

Forty-one completions were recorded during the week, including 25 oil wells and 16 dry holes. The average initial production of the oil wells was 165 bbl., ranging from 8 bbl. up to 888 bbl.

In the Calhoun pool in Richland County Phillips Petroleum Co. 4 Delilah, SW NW NE 7-2n-10e, was acidized in Lower O'Hara lime at 3,120-25 ft. and flowed 997 bbl. in 21 hours, but on its completion test flowed 785 bbl. in the same length of time.

In the Mattoon field in Coles County, Joe Kull 1 E. C. Craig, NE NE NW 26-12n-7e, mentioned last week, was completed. It flowed 428 bbl. in 24 hours through a ¾-in. choke producing from Aux Vases sand at 1,920-33 ft. It was shot with 100 qt. at 1,916-64 ft., total depth 1,974 ft. Another good new well in the pool was Howard Gordon 2 E. S. Watson, SE NE NE 3-11n-7e, which flowed 272 bbl. in 24 hours. It was given two shots at 1,790-1,827 ft. and 1,950-90 ft., total depth 2,010 ft. Cypress sand was recorded at 1,785-1,800 ft. and Aux Vases sand at 1,947-56 ft.

Thirty-two new operations were started during the week, including only three wildcats: T. B. Diricksen 1 F. E. Wilson, SE SE SE 17-11n-7e, Coles County; Ed Gieck 1 Feadley, NW NE SE 25-3n-13w, Lawrence County, and C. Wood 1 William Raber, SE SE SE 7-2s-13w, Wabash County.

SUCCESSFUL ILLINOIS WILDCATS

Clay County: J. J. Lynn and Pure Oil 1 J. A. Gorings, NE NE SW 24-3n-7e, between the Sailor Surings and the Clay City pools, McClosky lime 3,028-33 ft., TD 3,036 ft., 888 bbl. in 24 hours, natural flow. About 2 mi. from other production.

Clinton County: Paul Moseback 1 Jentzen, SE SE SE 29-2n-2w, Benoist sand 1,257-73 ft., TD 2,720 ft., shot at 1,256-71 ft., pumped 12 bbl. of oil and 98 bbl. of water. New pool.

Richland County: Central Pipe Line 1 Obald, NE SE NW 30-1n-14w, Benoist sand 2,882-90 ft., TD 2,892 ft. Pumped 91 bbl. in 24 hours. Extends Samsville pool.

ILLINOIS WILDCAT FAILURES

Clay County: Texas 1 E. Yount, NW SW NE 12-5n-7e, dry at 3,017 ft. Menard 2,178 ft., Cypress 2,581 ft., Benoist 2,736 ft., Aux Vases 2,808 ft., McClosky 2,898 ft., St. Louis 2,981 ft.

Jefferson County: Texas 1 H. Botts, NW NE NE 31-4s-4e, dry at 3,289 ft. Menard 2,305 ft., Cypress 2,798 ft., Benoist 3,011 ft., Aux Vases 3,067 ft., McClosky 3,199 ft., St. Louis 3,255 ft.

Saline County: Ashland 1 Galbreath, SE NE NE 20-7s-5e, dry at 3,380 ft. Menard 2,381 ft., Cypress 2,916 ft., Benoist 3,003 ft., Aux Vases 3,172 ft., McClosky 3,276 ft.

Washington County: Rock Island 1 Collmeyer, NW SW SW 25-1s-3w, dry at 1,475 ft. Glen Dean 1,000 ft., Cypress 1,196 ft., Benoist 1,345 ft.

Wayne County: Pure 1 William Farris, C W½ SW SE 21-1n-8e, dry at 3,161 ft. Menard 2,284 ft., Barlow 2,677 ft. No Cypress or Benoist recorded. Ste. Genevieve 3,044 ft., McClosky 3,095 ft.

CALIFORNIA

Standard Swabbing Leffingwell Test

LOS ANGELES.—Status of Standard Oil Co. 1 Lewis Comm., its important wildcat in the Leffingwell district, midway between the Santa Fe Springs and West Coyote fields, may be determined very soon. On a formation test, an unfavorable factor was the presence of a small amount of salt water, while a promising factor was four gas blows of varying amounts between the 20th and 70th stands. The well blew a fine mist and produced some oil which appeared to contain a high water cut, which might have been part of the water cushion.

Standard is starting an important wildcat several miles west of the Rio Vista gas field in Section 29-4n-1e. Standard and Amerada Petroleum Corp. have considerable acreage under lease in this district and another discovery of Rio Vista proportions would greatly increase gas reserves of the San Francisco area. Three zones have been found productive at Rio Vista and a new productive area was found a few months ago by Standard a few miles north of Rio Vista.

Recent data indicate a decided decline in drilling operations but the loss is not as much as would appear at a casual glance. During the early part of this year, Navy's program at Elk Hills resulted in the completion of many shallow wells with a minimum of delay between jobs. With completion of this program drilling contractors had to move equipment into other areas. As a consequence, the average completion depth has been increased and this has resulted in a lower number of completions. New locations made this week were on about a par with completions.

CALIFORNIA WILDCAT FAILURES

Fresno County, Burrel: General Petroleum 47-1 Burrel, 1-17s-18e, bottomed in hard gray sand, top Kreyenhagen 7,582 ft., Courtney sand 7,895 ft., Nortonville 7,989 ft., Domengine 7,994 ft., all sands gray and barren, TD 8,194 ft.

Raisin City: Union 38-29 Santa Ana and Fresno Land, 29-15s-18e, bottomed in conglomerate, Kreyenhagen 6,298-6,477 ft., Domengine 6,662 ft., only minor showings, TD 6,729 ft.

Kern County, Mojave: Thomas M. Blake 1 Cinco, 22-31s-37e, bottomed in hard sand, no showings of importance, TD 1,718 ft.

Los Angeles County, Turnbull Canyon: Los Angeles Brewing Co. 1 Jones Community, 24-2s-11w, bottomed in gray sand, Turnbull sand was gray and barren, TD 2,745 ft.

San Joaquin County, Isleton: Shell 1 Staten Island, 35-4n-4e, bottomed in hard gray sand, ran electric log, took side wall samples, no showings justified test. TD 6,500 ft.

San Luis Obispo County, Tar Springs: Amerada 2 Tar Springs Ranch, 14-32s-14e, bottomed in water sand, form. test 1,375-1,709 ft. recovered all fresh water, TD 1,709 ft.

Santa Barbara County, Los Alamos: Bel-Air Oil Co. 2 Price, 17-8n-32w, bottomed in gray sand, minor showings, all formation tests failed, TD 6,583 ft.

Solano County, Rio Vista: Peter Cook 1 Lower Unit, 2-4n-3e, bottomed in Eocene gray sand, Rio Vista gas sands were barren, TD 5,901 ft.

Tulare County, Cottonwood Creek: Winifred Schneider 1 Pritchett, 1-17s-24e, bottomed in granite basement, no showings logged, TD 1,330 ft.

OHIO, KENTUCKY

New Gas Field Opened In Guernsey County

COLUMBUS.—Ferguson and Smith on their second test have opened a Berea gas pool in the western part of Monroe Township, Guernsey County. The completion, 1 C. E. Gillespie, Sec. 15, topped the Berea sand at 1,305 ft. and finished in the sand at 1,353 ft. with 2,193,000 cu. ft. gas.

Indications of a new gas pool in Monroe Township, Richland County, were found by the Ohio Fuel Gas Co. on D. R. Culler, Sec. 3. Clinton sand at 2,628-35 ft. gaged 962,000 cu. ft. with a rock of 1,050 lb. Another test to the west will be drilled.

Twenty Grand 1 Walter Garey, Sec. 10, Reading Township, Perry County, made 120 bbl. after shot. Clinton sand, topped at 3,081 ft., was drilled to 3,107 ft. Three offsets to the well have been staked.

Ashland-Lorain field led in locations with 10 of 23, and in completions with 6 of 21.

OHIO SUCCESSFUL WILDCAT

Richland County, Monroe Township: Ohio Fuel 1 D. R. Culler, Sec. 3, Clinton 2,628-35 ft., 962,000 cu. ft., TD 2,642 ft.

OHIO WILDCAT FAILURE

Carroll County, Rose Township: F. L. Lyons 1 Hickory Clay Producing, Sec. 34, Clinton 5,098-5,192 ft. and 5,207-17 ft., dry, TD 5,223 ft.

EASTERN KENTUCKY

ASHLAND.—For the second successive week oil well completions held the spotlight in the eastern Kentucky fields, with no gas well completions recorded in the area.

Patterson, Dyer & Rader completed No. 2 on the Stapleton farm in Jackson County, 1,097 ft., 15 bbl., and No. 2 on the Charles Minter property in Jackson County, 1,100 ft., 5 bbl.

Elmer Duff et al completed No. 1 on the D. B. Strong farm, Sturgeon Creek in Jackson County, 998 ft., 10 bbl.; A. V. Hoenig completed No. 1 on the W. A. Hay farm (50 acres) in Lawrence County, 955 ft., 5 bbl.; and Kentucky Oil Co. completed No. 3 on the Jessie M. Smith property, Billy's Fork in Lee County, 852 ft., 5 bbl.

WESTERN KENTUCKY

OWENSBORO, Ky.—Carter Oil Co. completed two unusually good wells for this district, one the Waverly pool in Union County, the other in the Dixie pool in Henderson County. Carter 2 R. E. O'Nan, SW NE SW 21-O-22, Dixie pool, was completed in Cypress sand at 2,297-2,305 ft., swabbing 552 bbl. in 24 hours. It had not been shot. Carter 1 Cordia Markham, NE NE NE 15-O-21, Waverly pool, had McClosky limestone at 2,659-62 ft., the total depth, and after a 2,000-gal. acid treatment swabbed and flowed 504 bbl. in 24 hours. Sun Oil Co. 3 Fannie Pritchett, 21-O-22, in the Corydon pool, Henderson County, was good for 296 bbl. initially from Cypress sand at total depth 2,307 ft. A small well and a dry hole comprised the other completions of the week.

WESTERN KENTUCKY WILDCAT FAILURE

Hopkins County: AGW Oil Co. 1 Cummings, 9-I-25, dry at 2,170 ft. No log.

INDIANA

EVANSVILLE, Ind.—Three completions were reported from Indiana fields during the week. One was a gas well good for 1,500,000 cu. ft. in Spencer County, the others dry holes in Posey and Vanderburgh County. No wildcats were completed.